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

Proposed Resource Management Plan Amendment and Final Environmental Impact Statement for Oil and Gas Leasing and Development

Index No. BLM/CA/PL-2019/015+1610+1675+1793

Central Coast Field Office

May 2019

Bureau of Land Management
California State Office
2800 Cottage Way, Suite W-1623
Sacramento, CA 95825
(916) 978-4400

Bureau of Land Management
Central Coast Field Office
(formerly Hollister Field Office)
940 2nd Avenue
Marina, CA 93933
(831) 582-2200

Index No. BLM/CA/PL-2019/015+1610+1675+1793

Abstract

Lead Agency: U.S. Department of the Interior (DOI), Bureau of Land Management (BLM)

Type of Action: Administrative

Jurisdiction: San Francisco, San Mateo, Santa Cruz, Monterey, San Benito, Santa Clara, Alameda, southern Contra Costa, southwest San Joaquin, western Stanislaus, western Merced, and western Fresno Counties, California

Abstract: The BLM Central Coast Field Office (CCFO) is making the Final Environmental Impact Statement (EIS) and Proposed Resource Management Plan Amendment (RMPA) on oil and gas leasing and development available in accordance with Executive Order 13783: Promoting Energy Independence and Economic Growth, signed March 28, 2017; along with Secretarial Order 3349: American Energy Independence, signed March 29, 2017. This Proposed RMPA and Final EIS describes and analyzes the effects of alternative oil and gas management approaches on lands with Federal mineral estate administered by the BLM CCFO. The Proposed RMPA and Final EIS also describes and analyzes implementation-level decisions regarding 14 leases that were the subject of litigation in 2011 and 2012. The Planning Area is located in central California, and comprises approximately 6.8 million acres of land. Within the planning area, the BLM administers approximately 284,000 acres of surface estate and 793,000 acres of Federal mineral estate.

Sustainable development of oil and gas resources is a key component of the BLM's multiple use and sustained yield mission. In keeping with the Administration's goal of strengthening America's energy independence, the BLM supports an all-of-the-above energy plan that includes oil and gas, coal, strategic minerals, and renewable sources such as wind, geothermal, and solar – all of which can be developed on public lands. America's free markets will help determine if energy development on public lands is feasible. New circumstances and information regarding oil and gas exploration and development, including unconventional reservoirs and well stimulation techniques, have prompted the BLM to prepare this Proposed RMPA. As part of the RMPA, the BLM conducted scoping to solicit input from the public and interested agencies on the nature and extent of issues and impacts to be addressed. Upon publication of the Draft RMPA/Draft EIS in January 2017, BLM held three public meetings and solicited input from the public and interested agencies.

To assist the agency decision maker and the public in focusing on appropriate solutions to planning issues, the Proposed RMPA/Final EIS considers six alternative approaches to oil and gas leasing and development, including a new alternative (Alternative F) that was not included in the Draft RMPA/Draft EIS and is now identified as the Preferred Alternative.

Alternative A is a continuation of current management (No Action Alternative). Under this alternative, the BLM would continue to manage oil and gas development under the existing RMPs. **Alternative B** would limit the areas open to oil and gas leasing and development to lands within oil and gas fields and 0.5-mile buffer areas currently defined by the California Division of Oil, Gas, and Geothermal Resources. Under **Alternative C,** areas of high oil and gas potential or within oil and gas fields and 0.5-mile buffer would remain open. Areas of moderate and low potential and core population areas of the giant kangaroo rat in the vicinity of Panoche, Griswold,

Tumey, and Ciervo Hills would be closed. **Alternative D** would leave open Federal mineral estate underlying BLM surface estate and close split estate lands. The Ciervo-Panoche Natural Area would also be closed. Under **Alternative E,** Federal mineral estate outside of California DWR Bulletin 118 groundwater basins and sub-basins would be open; Federal mineral estate within these groundwater basins and sub-basins would be closed. Under **Alternative F** [BLM's Preferred Alternative], Federal mineral estate would be open to leasing; however; NSO stipulations would apply to some lands open to leasing, including: (1) Joaquin Rocks ACEC; (2) ACECs within Ciervo-Panoche Natural Area; and (3) giant kangaroo rat core population areas. Under all alternatives, areas closed under the 2007 RMP would remain closed (Wilderness, Wilderness Study Areas (WSAs), Clear Creek Serpentine Area of Critical Environmental Concern (ACEC), and Fort Ord National Monument).

Alternative F was selected as the **Preferred Alternative** based on the Administration's goal of strengthening energy independence and the BLM support of an all-of-the-above energy plan that includes oil and gas underlying America's public lands. The Preferred Alternative fulfills Federal Land Policy and Management Act (FLPMA) of 1976 mandate for multiple use and sustained yield of the BLM lands because it applies the least restrictions necessary to develop Federal minerals within existing oil and gas fields where the vast majority of oil and gas production is projected to occur. The Preferred Alternative includes NSO stipulations on 42,400 acres Federal mineral estate in the Joaquin Rocks ACEC, ACECs within the Ciervo-Panoche Natural Area and in core population areas of the giant kangaroo rat to avoid jeopardizing a core population of the giant kangaroo rat and directly impacting other sensitive biological and cultural resources. The Preferred Alternative directly supports the recovery plan for the species and may result in down-listing or delisting under the Endangered Species Act. The selection of Alternative F as the Preferred Alternative reflects careful balancing of many competing public interests in managing public lands in accordance with the multiple use mandate and other obligations in FLPMA. It also is based on comprehensive environmental analysis and full public involvement in accordance with the National Environmental Policy Act (NEPA).

The BLM is reviewing and streamlining its business processes to serve its customers and the public better and faster. When completed, the Record of Decision (ROD) for the RMPA will amend the BLM's 2007 RMP for the Southern Diablo Mountain Range and Central Coast of California to provide comprehensive long-range decisions for managing oil and gas resources in the CCFO. In publishing this Proposed RMPA/Final EIS, the BLM is initiating a 30-day public protest period. Protests must be postmarked or received no later than 30 calendar days following publication of the U.S. Environmental Protection Agency's Notice of Availability in the Federal Register. Please refer to the instructions in the Dear Reader letter preceding this abstract for additional information on how to protest.

For further information, please see the RMPA/EIS website at: https://www.blm.gov/programs/planning-and-nepa/plans-in-development/california/central-coast-rmp-amendment-for-oil-and-gas.

Central Coast Field Office

Proposed Resource Management Plan Amendment and Final Environmental Impact Statement for Oil and Gas Leasing and Development

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United States Department of the Interior
Bureau of Land Management
California State Office

Approved:

Joe Stout, Acting State Director

Estimated Lead Agency Total Costs Associated with Developing and Producing This RMPA/EIS:
$1,797,000

May 2019

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Central Coast Field Office
940 2nd Avenue
Marina, CA 93933
Phone (831) 582-2200 Fax (831) 582-2266

Dear Reader:

Enclosed for your review is the Bureau of Land Management's (BLM) Proposed Resource Management Plan Amendment (RMPA) and Final Environmental Impact Statement (EIS) for Oil and Gas Leasing and Development in the Central Coast Field Office (CCFO). The BLM Central Coast Field Office (CCFO) has prepared this RMPA and EIS to analyze the effects of alternative oil and gas management approaches on lands with Federal mineral estate within the CCFO planning area in accordance with Executive Order 13783: Promoting Energy Independence and Economic Growth, signed March 28, 2017; along with Secretarial Order 3349: American Energy Independence, signed March 29, 2017. This effort supports the Administration's goals of promoting environmentally responsible development of oil and gas on public lands, creating jobs and providing economic opportunities.

The BLM prepared this plan with input from interested agencies, organizations and individuals, taking into account public comments received during this planning effort. The plan describes and analyzes a range of alternatives that updates and revises the existing Resource Management Plan for the Southern Diablo Mountain Range and Central Coast of California (2007). Among these alternatives is the BLM's Proposed RMPA, as well as a description of the no-action alternative, a continuation of the existing management plan. The Proposed RMPA and Final EIS also describes and analyzes implementation-level decisions regarding 14 leases that were the subject of litigation in 2011 and 2012.

The Proposed RMPA/Final EIS has been developed in accordance with the National Environmental Policy Act of 1969, as amended, and the Federal Land Policy and Management Act of 1976, as amended. New information, public comments, and current policies and priorities resulted in a variety of clarifications and modifications from the Draft RMPA/Draft EIS to the Proposed RMPA/Final EIS. Revisions include the removal of the BLM 2015 Final Rule on Hydraulic Fracturing on Federal and Indian Lands, which has been rescinded, as well as the addition of a new alternative, Alternative F. The BLM has also conducted additional field inventories in the planning area and analyzed potential effects by BLM's oil and gas leasing and development program.

This Proposed RMPA is based on Alternative F, the newly identified Preferred Alternative. The Proposed RMPA/Final EIS contains a summary of changes made between the Draft RMPA/Draft EIS and Proposed RMPA/Final EIS, analysis of the impacts of management alternatives, a summary of written and verbal comments received during the public review period for the Draft RMPA/Draft EIS, and BLM's responses to comments.

Pursuant to BLM's planning regulations at 43 Code of Federal Regulations (CFR) 1610.5-2, any person who participated in the planning process for this Proposed RMPA and has an interest which is or may be adversely affected by the planning decisions may protest approval of the planning decisions in this document within 30 days from the date the Environmental Protection Agency publishes the Notice of Availability of the Final EIS in the *Federal Register*.

Detailed instructions for filing such a protest with the Director of the BLM are available online at https://www.blm.gov/programs/planning-and-nepa/public-participation/filing-a-plan-protest.

All protests must be in writing and filed with the BLM Director, either as a hard copy or electronically via BLM's ePlanning website by the end of the protest period.

To file a protest electronically, visit https://tinyurl.com/jhsrwrp and click the 'Submit Protest' button to the right of the Final EIS document. Protests in hard copy must be mailed to one of the following addresses, postmarked no more than 30 days from the date the Environmental Protection Agency publishes the Notice of Availability of the Final EIS in the *Federal Register*:

Regular Mail
Bureau of Land Management
Director (210)
Attention: BLM Protest Coordinator
P.O. Box 71383
Washington, D.C. 20024-1383

Overnight Mail
Bureau of Land Management
Director (210)
Attention: BLM Protest Coordinator
20 M Street SE, Room 2134LM
Washington, D.C. 20003

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

The BLM Director will make every attempt to promptly render a decision on each protest. The decision will be in writing and will be sent to the protesting party by certified mail, return receipt requested. The decision of the BLM Director shall be the final decision of the Department of the Interior. Responses to protest issues will be compiled and formalized in a Director's Protest Decision Report made available following the issuance of the decisions.

Upon resolution of all protests, the BLM will issue the Approved RMP and Record of Decision (ROD). The Approved RMP and ROD will be available to all who participated in the planning process and will be available to all parties through the "Planning" page of the BLM National Web site (www.blm.gov/planning).

Unlike planning decisions, implementation decisions included in this Proposed RMPA, such as the determination for the 14 leases subject to the settlement agreement, are not subject to protest under the BLM planning regulations, but are subject to administrative remedies and review, primarily through appeal to the U.S. Department of the Interior Office of Hearing and Appeals, Interior Board of Land Appeals pursuant to 43 CFR Part 4 Subpart E. Implementation decisions generally constitute the BLM's final approval allowing on-the-ground actions to proceed. Where implementation decisions are made as part of the land use planning process, they are still subject to the appeals process or other administrative review as prescribed by specific resource program regulations after the BLM resolves the protests to land use planning decisions and issues a plan and ROD. The Approved RMPA and ROD will therefore identify the implementation decisions made in the plan that may be appealed to the Office of Hearing and Appeals.

We appreciate your interest and encourage your continued involvement in the planning process.

Sincerely,

Joe Stout
Acting State Director

Contents

Tables

Figures

All figures appear in Appendix A

Appendices

List of Acronyms

AAR	American Association of Railroads
ACEC	Area of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
ADSA	Axial dimensional stimulation area
AFY	Acre-feet per year
AIRFA	American Indian Religious Freedom Act
AML	Abandoned mine lands
AMSCM	Abandoned Mine – Site Cleanup Module
ANILCA	Alaska National Interest Lands Conservation Act
ANSI	American National Standards Institute
APD	Application for Permit to Drill
APEFZA	Alquist-Priolo Earthquake Fault Zoning Act
API	American Petroleum Institute
AQMP	Air quality management plan
AQRV	Air quality related value
ARB	Air Resources Board
ARPA	Archeological Resources Protection Act
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATV	All-terrain vehicle
BAAQMD	Bay Area Air Quality Management District
BAT	Best available technology
BCT	Best conventional pollutant control technology
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BMPs	Best Management Practices
BO	Biological Opinion
BOP	Blowout preventer
BOPE	Blowout Prevention Equipment
BRM	Bedrock mortar
BTEX	Benzene, toluene, ethylbenzene, and xylene
CAA	Clean Air Act
CalARP	California Accidental Release Prevention
CalEPA	California Environmental Protection Agency
CAP	Clean air plan
CASGEM	California Statewide Groundwater Elevation Monitoring
CCFO	Central Coast Field Office
CCR	California Code of Regulations
CCST	California Council on Science and Technology
CDFW	California Department of Fish and Wildlife
CDPR	California Department of Parks and Recreation
CDWR	California Department of Water Resources
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CGP	Construction General Permit
CGS	California Geological Survey
CHRIS	California Historic Resources Information System
CI	Carbon Intensity
COA	Condition of Approval
CPNA	Ciervo-Panoche Natural Area
CSFM	California State Fire Marshal
CSLC	California State Lands Commission
CSU	Controlled Surface Use
CTTM	Comprehensive Travel and Transportation Management
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DDW	Division of Drinking Water
DDWEM	Division of Drinking Water and Environmental Management
DHS	Department of Health Services
DOC	Department of Conservation
DOGGR	Division of Oil, Gas, and Geothermal Resources
DOI	Department of the Interior
DPS	Distinct population segment
DSA	Division of the State Architect
DWR	Department of Water Resources
DWSAP	Drinking Water Source Water Assessment Program
EFH	Essential fish habitat
EHRA	Earthquake Hazards Reduction Act
EIS	Environmental Impact Statement
EISA	Energy Independence and Security Act of 2007
EO	Executive Order
EOR	Enhanced oil recovery
EPA	Environmental Protection Agency
ERPG	Emergency response planning guidelines
ESA	Endangered Species Act
ESI	Ecological Site Inventory
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FLPMA	Federal Land Policy and Management Act
FORA	Fort Ord Reuse Authority
FRA	Federal Railroad Administration
FWS	Fish and Wildlife Service
GAO	Government Accountability Office
GGRP	Greenhouse Gas Reporting Program
GHG	Greenhouse gas
GIS	Geographic Information System

GSA	Groundwater sustainability agency
GSP	Groundwater sustainability plan
GWP	Global warming potential
HAP	Hazardous air pollutant
HCP	Habitat Conservation Plan
HFC	Hydrofluorocarbon
HMR	Hazardous Materials Regulation
HMRR	Hazard Management and Resource Restoration
HSC	Health and Safety Code
HSWA	Hazardous and Solid Waste Act
HUC	Hydrologic Unit Code
HVL	Highly volatile liquids
HWCL	Hazardous Waste Control Law
I-	Interstate
IDLH	Immediately Dangerous to Life and Health
IM	Instruction Memorandum
IMP	Interim Management Policy
IPCC	Intergovernmental Panel on Climate Change
LBNL	Lawrence Berkeley National Laboratory
LCFS	Low Carbon Fuel Standard
LLNL	Lawrence Livermore National Laboratory
LSAA	Lake or Streambed Alteration Agreement
LWC	Lands with wilderness characteristics
MA	Management Area
MBTA	Migratory Bird Treaty Act
MBUAPCD	Monterey Bay Unified Air Pollution Control District
MCL	Maximum contaminant level
MLA	Mineral Leasing Act
MMBOE	Million barrels of oil equivalent
MOU	Memorandum of Understanding
MRR	Mandatory reporting rule
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NCCP	Natural community conservation plan
NCP	National Oil and Hazardous Substances Contingency Plan
NCSHPO	National Conference of State Historic Preservation Officers
NEHRP	National Earthquake Hazards Reduction Program
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NGL	Natural gas liquid
NHMLAC	Natural History Museum of Los Angeles County
NHPA	National Historic Preservation Act
NHSA	National Historic Sites Act
NHTSA	National Highway Traffic Safety Administration
NIOSH	National Institute for Occupational Safety and Health
NITS	National Institute of Standards and Technology

NMFS	National Marine Fisheries Service
NOA	Naturally occurring asbestos
NOI	Notice of Intent
NORM	Naturally occurring radioactive materials
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPPA	Native Plant Protection Act
NPRPA	Naval Petroleum Reserves Production Act of 1976
NRHP	National Register of Historic Places
NRT	National Recreational Trail
NSF	National Science Foundation
NSO	No Surface Occupancy
NSR	New Source Review
NTL	Notices to Lessee
NWSR	National Wild and Scenic River
OEHHA	Office of Environmental Health Hazard Assessment
OES	Office of Emergency Services
OHV	Off-highway vehicle
OPA	Oil Pollution Act
OPLMA	Omnibus Public Lands Management Act
OSHA	Occupational and Safety Health Act
OSHPD	Office of Statewide Health, Planning, and Development
OSPR	Office of Spill Prevention and Response
OSPRA	Oil Spill Prevention and Response Act
PA	Programmatic Agreement
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyl
PEIS	Programmatic Environmental Impact Statement
PEL	Permissible exposure limit
PFC	Properly functioning condition
PFYC	Potential Fossil Yield Classification
PGA	Peak Ground Acceleration
PHMSA	Pipeline and Hazardous Materials Safety Administration
PM	Particulate Matter
PM10	Particulate matter (less than 10 microns in diameter)
PM2.5	Fine particulate matter (less than 2.5 microns in diameter)
PRO	Industrial Process Supply
PRPA	Paleontological Resources Preservation Act
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
RFD	Reasonably Foreseeable Development
RMP	Resource Management Plan
RMPA	Resource Management Plan Amendment
RMP	Resource Management Plan
RNA	Research Natural Area
ROD	Record of Decision

ROG	Reactive organic gases
ROW	Right-of-way
RTE	Rare, threatened, and endangered
RWQCB	Regional water quality control board
SB	Senate Bill
SB4	Senate Bill 4
SCAQMD	South Coast Air Quality Management District
SDS	Safety Data Sheet
SDWA	Safe Drinking Water Act
SEAB	Secretary of Energy Advisory Board
SGMA	Sustainable Groundwater Management Act
SHMA	Seismic Hazards Mapping Act
SHP	Seismic Hazards Program
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SJVAPCD	San Joaquin Valley Air Pollution Control District
SMARA	Surface Mining and Reclamation Act
SMA	Special Management Area
SN	Sundry Notice
SOP	Standard Operating Procedure
SPCC	Spill Prevention, Control, and Countermeasure
SPP	Spill Prevention Plan
SSA	Sole Source Aquifer
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TAC	Toxic air contaminant
TDS	Total dissolved solids
TL	Timing Limitation
TMDL	Total maximum daily load
UIC	Underground Injection Program
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDOT	U.S. Department of Transportation
USDW	Underground Source of Drinking Water
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UVCE	Unconfined vapor cloud explosion
VOC	Volatile organic compounds
VRI	Visual Resource inventory
VRM	Visual resource management
WDR	Waste Discharge Requirement
WQO	Water quality objective
WSA	Wilderness Study Area
WSR	Wild and Scenic River

List of Preparers

List of Preparers

Individual / Title	Role / Issue Area
Bureau of Land Management – NEPA Co-Lead Agency	
Jerome E. Perez	California State Director (State Office)
Jim Scrivner	Deputy State Director, Energy & Minerals (State Office)
Mark Chatterton	Branch Chief, Energy & Minerals (State Office)
Leroy Mohorich	Oil & Gas Program Lead (State Office)
Anne E. Stifel	District Manager (Central Coast District Office)
Benjamin Blom	Field Manager (Central Coast Field Office)
Erik Zaborsky	Associate Field Manager (Central Coast Field Office)
Sky Murphy	Project Manager (Central Coast Field Office)
John Hodge	Deputy Director of Minerals (Bakersfield Field Office)
Jeff Prude	Petroleum Engineer (Bakersfield Field Office)
Ryan O'Dell	Natural Resource Specialist (Botany, Soils: Central Coast Field Office)
Michael Westphal	Ecologist (Central Coast Field Office)
Adam Wilde	Outdoor Recreation Specialist (Central Coast Field Office)
Patrick Mbaba	Petroleum Engineer (State Office)
Sandra MicGinnis	Resource Branch Chief (State Office)
Melissa Harris	Planning & Environmental Coordinator (State Office)
Elizabeth Meyer-Shields	Planning & Environmental Coordinator (State Office)
Aspen Environmental Group	
Hedy Koczwara, Sr. Associate	Project Manager, RFD Scenario
Emily Capello, Sr. Associate Environmental Scientist	Deputy Project Manager, Energy and Minerals
James Brewster Birdsall, Senior Associate, PE, QEP	RFD Scenario, Air Quality, GHG Emissions, Hazardous Materials and Public Safety
Scott Debauche, CEP	Social and Economic Conditions, Transportation and Access, Utility Corridors and Communication Sites
Tatiana Inouye, Associate Planner	Special Management Areas, Lands and Realty, Wild and Scenic Rivers
Matthew Long, Associate	Geology, Hazardous Materials, Soil Resources
Philip Lowe, Senior Associate, PE	Surface Water Resources
Tracy Popiel, GIS Specialist	GIS Analysis and Figures
Negar Vahidi, Senior Associate Planner	Reviewer Special Management Areas, Lands and Realty, Wild and Scenic Rivers, Social and Economic Conditions, Transportation and Access, Utility Corridors and Communication Sites

List of Preparers

Individual / Title	Role / Issue Area
Carla Wakeman, Associate Biologist	Biological Resources: Vegetation, Wildlife Habitat, Special Status Species
Scott White, Senior Associate Biologist	Reviewer Biological Resources
Applied Earthworks, Inc.	
Carrie Chasteen, Senior Architectural Historian, MS	Cultural and Heritage Resources
Jessica DeBusk, Senior Paleontologist, BS	Paleontological Resources
Erin Enright, Senior Archaeologist, MA, RPA	Cultural and Heritage Resources
Richard Hanes, Environmental Compliance Specialists, PhD, RPA	Cultural and Heritage Resources, Reviewer Paleontological Resources
Geotechnical Consultants, Inc.	
James Thurber, PG, CHG, CEG	Energy and Minerals, Geology, Hazardous Materials, Soil Resources
ioMosaic	
Gemma Dunjo	Public Safety
Elena Prats, Partner	Public Safety
Peter Stickles, PE	Public Safety
Michael Clayton & Associates	
Michael Clayton	Visual Resource Management
Todd Groundwater	
Alain Boutefeu, Senior Cartographer	GIS
Liz Elliott, Sr. Hydrogeologist, PG, CHG	Groundwater Resources
Iris Priestaf, President	Reviewer
Amber Ritchie, Staff Hydrogeologist	Groundwater Resources
Phyllis Stanin, Principal Geologist	Reviewer
Kate White, Senior Engineer	Groundwater Resources

Executive Summary

ES.1 Introduction

The Bureau of Land Management (BLM) Central Coast Field Office[1] (CCFO) has prepared this Resource Management Plan Amendment and Environmental Impact Statement (RMPA/EIS) for oil and gas leasing and development to analyze the effects of alternative oil and gas management approaches on lands with Federal mineral estate within the CCFO Planning Area. Resource Management Plans (RMPs) are land use plans that establish goals and objectives for resource management and guide land management actions, which are based on the principles of multiple use and sustained yield. Over time, decisions on how the land is managed need to be revised or amended to respond to new, intensified, or changed uses on public land, prompting an RMP revision or amendment. Here, new circumstances and information regarding oil and gas exploration and development, including unconventional reservoirs and well stimulation techniques, have prompted the BLM to prepare this RMPA to the 2007 RMP for the Southern Diablo Mountain Range and Central Coast of California, also known and referred to in this EIS as the Hollister Field Office RMP. To support the preparation of this RMPA, the BLM has completed this Final EIS that provides a comprehensive evaluation of the environmental issues and impacts associated with the Proposed RMPA and alternatives. The Proposed RMPA and Final EIS also describes and analyzes implementation-level decisions regarding 14 leases that were the subject of litigation in 2011 and 2012.

The BLM CCFO is making this Final EIS and proposed RMPA on oil and gas leasing available in accordance with Executive Order 13783: Promoting Energy Independence and Economic Growth, signed March 28, 2017; along with Secretarial Order 3349: American Energy Independence, signed March 29, 2017. In keeping with the Administration's goal of strengthening America's energy independence, the BLM supports an all-of-the-above energy plan that includes oil and gas, coal, strategic minerals, and renewable sources such as wind, geothermal, and solar – all of which can be developed on public lands. America's free markets will help determine if energy development on public lands is feasible. The BLM is also reviewing and streamlining its business processes to serve its customers and the public better and faster.

ES.2 Planning Area Description

The Planning Area is the geographical boundaries of the CCFO. This includes 6.8 million acres of Federal, State, and private lands across all or portions of the following 12 counties in western-central California:

- Alameda
- Contra Costa
- Fresno
- Merced
- Monterey
- San Benito
- San Francisco
- San Joaquin
- San Mateo
- Santa Clara
- Santa Cruz
- Stanislaus

The CCFO manages public land in 11 of these counties; there are currently no BLM-managed public lands or federal minerals in San Francisco County (see Figure 1-1). Public land parcels vary in size from less than 40 acres to more than 50,000 acres. The most notable holdings are located in the western San Joaquin Valley.

The Decision Area for the RMPA includes approximately 793,000 acres of BLM-administered subsurface mineral estate underlying public lands or split estate lands within the CCFO Planning Area. Split estate means lands where the surface is owned by an entity or person other than the BLM but the Federal subsurface mineral estate is managed by the BLM. Split estate leases are included in the Decision Area

[1] The Central Coast Field Office, currently located in Marina, California, was previously called the Hollister Field Office.

and would be subject to the oil and gas resource management decisions of the RMPA. The BLM lands at the Cotoni-Coast Dairies unit of the California Coastal National Monument are not a part of the Decision Area because BLM does not manage the mineral estate underlying this unit of the Monument in Santa Cruz County.

ES.3 Overall Vision

The overall vision of the RMPA planning effort is to provide a collaborative community based planning approach to update the existing management decisions and resource allocations for oil and gas leases by addressing new data, changing resource conditions, and changes in the use of public land that have occurred since the 2007 Hollister Field Office RMP was completed. Numerous partners and cooperating agencies were involved in this process and have provided a variety of data in support of this effort.

ES.4 Purpose and Need for Amending the 2007 Hollister Resource Management Plan

Following a court order and settlement agreement in *Center for Biological Diversity v. Bureau of Land Management*, and a related case, the BLM agreed to prepare an EIS addressing oil and gas development within the CCFO to determine appropriate stipulations for the two suspended non-NSO leases referenced in Case No. 11-06174 (Hollister I) and the 12 prospective non-NSO leases identified in Case No. 13-01749 (Hollister II).[2]

In response to the Hollister I and II litigation and settlement agreement, the BLM developed a new Reasonably Foreseeable Development (RFD) Scenario paying greater attention to the current and future use of well stimulation technologies, including hydraulic fracturing, acid matrix stimulation, and acid fracturing, as well as future uses of enhanced oil recovery (see Appendix B). Because this RFD Scenario forecasts a greater amount of development as compared to the RFD Scenario developed for the 2007 RMP, there is a need to consider whether the land use plan decisions in the 2007 RMP should be adjusted. An RMPA is also needed to address the current and potential future uses of well stimulation technologies, as well as future uses of enhanced oil recovery.

The purpose of this amendment to the 2007 Hollister Field Office RMP is to determine which BLM-managed lands or subsurface Federal minerals are open or closed to oil and gas leasing, and which stipulations or restrictions apply to protect specific resources, based on an analysis of oil and gas exploration and development in excess of levels evaluated in the 2007 RMP. The RMPA would not authorize any actual drilling for exploration or development of oil and gas resources. Actual drilling authorization would be analyzed on a site specific basis dependent on the project specifications before the BLM at that time.

Decisions to be made: Through the RMPA, the BLM will identify which lands are open or closed to oil and gas leasing and which stipulations would be applied on oil and gas exploration and development activities in order to protect environmental resources. For the 14 leases subject to the settlement agreement, BLM will determine by issuing a separate implementation decision whether the two non-NSO leases referred to in Hollister I should have been issued at all or whether stipulations should be added or revised, and whether the 12 prospective non-NSO leases referred to in Hollister II should be issued with revised or additional stipulations or if BLM should reject the bid and decline issuance of the leases.

[2] The *Center for Biological Diversity v. Bureau of Land Management* (Case No. 11-06174; Hollister I) decision found that the BLM violated NEPA when it failed to prepare an EIS prior to issuing two non-NSO leases. BLM has agreed to prepare an EIS to analyze and assess the adequacy of proposed stipulations for the non-NSO leases referenced in Hollister I, and has suspended operations and production on those leases. The BLM has also agreed to not issue and to assess the adequacy of proposed stipulations for 12 prospective non-NSO leases identified in Case No. 13-01749 (Hollister II), pending completion of the EIS (*Center for Biological Diversity v. Bureau of Land Management*, 2014).

ES.5 Public Involvement and Agency Cooperation

This document has been prepared with input from interested agencies, organizations, and individuals. Public participation is ongoing throughout the planning process.

Four public scoping workshops were held in January and February 2014 to initiate the public involvement process for the Central Coast RMPA. BLM's official scoping comment period began August 5, 2013, with the publication of the Notice of Intent in the Federal Register. The comment period ran for 207 days ending on February 28, 2014, to incorporate the comments received during the public scoping workshops.

Additionally, a social and economic strategies workshop was held to provide an opportunity for local government officials, community leaders, and other citizens to discuss regional economic conditions, trends, and strategies with BLM managers and staff (see Appendix F).

Following publication of the Draft RMPA/EIS in the Federal Register on January 6, 2017, BLM held three public meetings in March 2017 to provide the public with information on the Plan and an opportunity to comment. More than 113 people attended, and 54 individuals presented verbal comments during the three public meetings (see Appendix H). The Draft RMP Amendment/Draft EIS public review and comment period closed on April 6, 2017. The Proposed RMPA/Final EIS considers all substantive oral and written comments received during the 90-day public comment period for the Draft RMPA/EIS.

Members of the public with standing have the opportunity to protest the content of this Proposed RMPA/Final EIS during the specified 30-day protest period. A Record of Decision (ROD) and Approved RMPA will be issued by the BLM after the release of the Proposed RMPA/Final EIS, the Governor's Consistency Review, and protest resolution. The parties with standing will have the opportunity to appeal implementation level decisions during the 30 days following the release of the ROD/Approved RMPA.

ES.6 Planning Issues

In its planning process, the BLM addresses issues and unresolved conflicts, as presented in the NEPA regulations. Issues may include demands for resources, as well as concerns and conflicts, associated with balancing a mix of multiple uses, or unresolved conflicts associated with past, present, and future management of public lands or resources. As part of the scoping process, the BLM solicited comments and concerns from the public, organizations, tribes, and Federal, State, and local agencies, as well as from BLM specialists. In addition, certain issues and unresolved conflicts were identified during scoping by the BLM. Issues identified during scoping are described in Chapter 1 of this EIS (see also Appendix E).

ES.7 Changes Between Draft RMPA/EIS and Proposed RMPA/Final EIS

Changes made between the Draft RMPA/Draft EIS and the Proposed RMPA/Final EIS include the removal of the BLM 2015 Final Rule on Hydraulic Fracturing on Federal and Indian Lands, which has been rescinded, as well as the addition of a new alternative, Alternative F, the newly identified Preferred Alternative. BLM has also conducted field inventories of all units with potential wilderness characteristics and the Proposed RMPA/Final EIS identifies lands with wilderness characteristics in the Planning Area and how they would be affected by BLM's oil and gas leasing and development program.

ES.8 Proposed Resource Management Plan Amendment

The BLM used several sources of input to develop alternatives, including existing decisions in the 2007 Hollister Field Office RMP and the 2015 Reasonably Foreseeable Development (RFD) Scenario. The public scoping process, conducted from August 5, 2013, to February 28, 2014, provided an opportunity for interested members of the public, local governments, and other resource and land management agencies to

comment on the planning process and/or management concerns for oil and gas resources. From the comments received, the BLM identified the key planning issues to be addressed in the Draft RMPA/EIS and incorporated them into the range of alternatives. The alternatives described in this chapter represent a range of management options to address the issues identified during scoping, the social and economic workshop, and from public comments on the Draft RMPA/EIS, to achieve resource management goals in the CCFO Planning Area.

The EIS impact analysis will also address 14 leases within the CCFO Decision Area, per a July 2014 Federal court settlement agreement to resolve the disputes set forth in Hollister I and II. While BLM will select a Preferred Alternative as part of its plan-level decision for determining which BLM-managed lands or subsurface Federal minerals are open or closed to oil and gas leasing, the determination for the 14 leases will be an implementation-level decision. For each of the 14 leases, the implementation decision will determine whether the leases should be issued, and if so, whether the current stipulations are sufficient or if additional stipulations are needed.

In 2015, the BLM prepared an updated RFD Scenario to project levels and types of industry activity and the associated surface disturbance that are likely to occur on all mineral estate managed by the BLM in the CCFO Planning Area. The 2015 RFD Scenario is based on known or inferred oil and gas occurrence potential based on California Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR) records, independent assessments of scientific literature, and knowledge of local experts with experience in the leasing and development of Federal minerals. The lands included in the RFD Scenario are limited to those with BLM-administered minerals, including split estate lands where the surface estate is owned by an entity or person other than the BLM. The 2015 RFD Scenario applies to all alternatives.

Overall, the 2015 RFD Scenario assumes that the current development trends in this region are likely to continue for the next 15 to 20 years. It estimates that during the life of this plan, between zero and 32 development wells could be expected on Federal mineral estate within existing fields in the CCFO Planning Area and three to five exploratory wildcat wells (wells outside of existing oil and gas fields) would be drilled on Federal mineral estate in the CCFO Planning Area. Well stimulation technologies and enhanced oil recovery techniques are assumed to be used on any or all of these wells.

Table ES-1 shows a summary of the acreages for each of the alternatives described below. Table ES-2 summarizes the leases subject to the settlement agreement by each alternative.

Table ES-1. Acreages of the Alternatives

	Calculated GIS Acres Open with CSU	Calculated GIS Acres Closed	Calculated GIS Acres Open with NSO
Alternative A (No Action)	683,800	67,500	41,700
Alternative B	39,000	754,000	N/A
Alternative C	368,800	394,400	29,800
Alternative D	121,200	655,400	16,400
Alternative E	487,200	99,400	206,400
Alternative F (Preferred)	683,100	67,500	42,400

Note: GIS = Geographic Information System; CSU = Controlled Surface Use; NSO = No Surface Occupancy.

Table ES-2. Summary of Leases Subject to Settlement by Alternative

	Calculated GIS Acres Open with CSU	Calculated GIS Acres Closed	Calculated GIS Acres Open with NSO
Alternative A (No Action)	17,600	N/A	N/A
Alternative B	3,800	13,800	N/A
Alternative C	17,600	N/A	N/A
Alternative D	4,400	13,200	N/A
Alternative E	10,000	400	7,200
Alternative F (Preferred)	17,600	N/A	N/A

Note: GIS = Geographic Information System; CSU = Controlled Surface Use; NSO = No Surface Occupancy.

Table ES-3. Summary of Leases Subject to Settlement Agreement

	Alternative B			Alternative D			Alternative E		
Lease	Calculated GIS Acres Open with CSU	Calculated GIS Acres Closed	Calculated GIS Acres Open with NSO	Calculated GIS Acres Open with CSU	Calculated GIS Acres Closed	Calculated GIS Acres Open with NSO	Calculated GIS Acres Open with CSU	Calculated GIS Acres Closed	Calculated GIS Acres Open with NSO
Hollister I									
CACA 052959	—	110	—	80	30	—	—	—	110
CACA 052960	—	2,280	—	150	2,130	—	1,740	20	520
Hollister II									
CACA 053824	—	1,150	—	10	1,140	—	—	—	1,150
CACA 053825	—	2,150	—	130	2,020	—	70	—	2,080
CACA 053826	—	2,020	—	580	1,440	—	1,600	—	420
CACA 053827	—	270	—	—	270	—	—	—	270
CACA 053828	360	800	—	290	870	—	1,100	60	—
CACA 053829	860	—	—	860	—	—	580	—	280
CACA 053830	1,090	—	—	1,090	—	—	570	20	500
CACA 053831	1,100	810	—	550	1,360	—	1,610	240	60
CACA 053832	—	1,050	—	10	1,040	—	950	—	100
CACA 053833	380	70	—	220	230	—	130	—	320
CACA 053834	20	2,080	—	40	2,060	—	1,240	—	860
CACA 053835	—	1,000	—	390	610	—	450	40	510

Note: Alternatives A, C and F are not shown in Table ES-3, because areas subject to NSO or closed would be negligible (less than 0.5 percent).

Alternative A. Alternative A would continue current management under the existing Hollister Field Office RMP (BLM, 2007). All Federal mineral estate would be available for oil and gas leasing, except for designated wilderness, wilderness study areas (WSAs), Fort Ord National Monument, and Clear Creek Serpentine Area of Critical Environmental Concern (ACEC). NSO stipulations would be applied in ACECs and Recreation and Public Purpose (R&PP) leases. The Endangered Species stipulation from the 2007 Hollister Field Office RMP would apply in all areas open to leasing.

Under Alternative A, there would be two subalternatives for the leases. Under Subalternative 1, all of the BLM-managed areas (approximately 17,600 acres) that contain the 14 non-NSO leases referenced in Hollister I and II would be open to leasing and they would be issued. The Endangered Species stipulation from the 2007 Hollister Field Office RMP would apply in all areas of the leases.

Under Subalternative 2, the management decisions for Alternative A would still apply, and the BLM-managed areas that contain the 14 non-NSO leases referenced in Hollister I and II would be open to leasing. However, for analysis purposes, the implementation decision would be: (1) that the two non-NSO leases referenced in Hollister I should not have been issued; and (2) to not issue the 12 prospective non-NSO leases referenced in Hollister II.

Alternative B. Under Alternative B, Federal mineral estate within the boundaries of oil and gas fields, plus a 0.5-mile buffer defined by DOGGR[3] would be available for leasing. Other areas would be closed to oil and gas leasing. Controlled Surface Use (CSU) stipulations would apply to all lands open to leasing. Because of the limited areas open to leasing in this alternative, only up to 32 development wells would be anticipated to be drilled. No exploratory wildcat wells are anticipated.

Under Alternative B, of the BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and II, approximately 3,800 acres would be open with CSU stipulations and the implementation decision would be to issue leases for those acres with CSU stipulations, and 13,800 acres would be closed, see Table ES-3.

Alternative C. Under Alternative C, unless currently closed under the 2007 Hollister Field Office RMP, Federal mineral estate would be open to leasing within high oil and gas potential areas or within the boundaries of oil and gas fields, plus a 0.5-mile buffer currently identified by DOGGR, with the exception of core population areas of the giant kangaroo rat in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills, which are closed to leasing. CSU stipulations would apply to all lands open to leasing. NSO stipulations would apply to some lands open to leasing, including: (1) critical habitat for Federally listed species; (2) BLM developed recreation and administrative sites; and (3) special status split estate lands (e.g., state parks, county parks, conservation easements, land trusts, and scenic designations).

Under Alternative C, of the BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and II, approximately 17,600 acres would be open with CSU stipulations and the implementation decision would be to issue all 14 non-NSO leases with CSU stipulations (see Table ES-3).

Alternative D. Under Alternative D, unless currently closed under the 2007 Hollister Field Office RMP, Federal mineral estate underlying BLM surface estate would be available for leasing. All BLM split estate lands and the Ciervo Panoche Natural Area (both BLM surface and split estate lands) would be closed to leasing. CSU stipulations would apply to all lands open to leasing. NSO stipulations would be applied in ACECs and R&PP leases.

Under Alternative D, of the BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and II, approximately 13,200 acres would be closed and 4,400 acres would be open with CSU stipulations and the implementation decisions would be to issue leases for those 4,400 acres with CSU stipulations, see Table ES-3.

Alternative E. Under Alternative E, unless currently closed under the 2007 Hollister Field Office RMP, Federal mineral estate outside of a California Department of Water Resources Bulletin 118, Groundwater Basin or Sub-basin, would be available for leasing. CSU stipulations would apply to all lands open to leasing. NSO stipulations would apply to some lands open to leasing, including: (1) 12-digit Hydrologic Unit Codes (HUCs) intersecting EPA impaired, perennial surface waters (BLM surface and split estate); (2) 12-digit HUCs intersecting non-impaired, perennial surface waters that intersect split estate; (3) 12-digit HUC subwatersheds with the highest aquatic intactness score; (4) 0.25 miles from non-impaired, perennial surface waters; and (5) 0.25 miles from eligible Wild and Scenic Rivers.

[3] In the Environmental Impact Report prepared by DOGGR under Senate Bill 4, each oil and gas field includes a buffer area around it within which future activities may occur. Within the CCFO Planning Area, the buffer is 0.5 miles around existing fields. (DOC, 2015 page 5-1)

Under Alternative E, of the BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and II, approximately 10,000 acres would be open with CSU stipulations and the implementation decision would be to issue leases on those acres with CSU stipulations, 7,200 acres would be open with NSO and the implementation decision would be to issue leases on those acres with NSO, and 400 acres would be closed, see Table ES-3.

Alternative F. Under Alternative F, unless currently closed under the 2007 Hollister Field Office RMP, Federal mineral estate would be would be open to leasing. CSU stipulations would apply to all lands open to leasing. NSO stipulations would apply to some lands open to leasing, including: (1) Joaquin Rocks ACEC; (2) ACECs within Ciervo-Panoche Natural Area; and (3) giant kangaroo rat core population areas.

Under Alternative F, of the BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and II, approximately 17,600 acres would be open with CSU stipulations and the implementation decision would be to issue all 14 non-NSO leases with CSU stipulations (see Table ES-3).

Preferred Alternative. Alternative F is the BLM's current Preferred Alternative. The identification of the Agency Preferred Alternative is based on BLM planning regulations (BLM Manual 1790-1, Ch. 9, Section 9.2.7.3). This is not a final agency decision, but instead an indication of the agency's preliminary preference. The Proposed RMPA reflects changes or adjustments based on public comments, new information, and changes in BLM policies or priorities. The BLM re-evaluated the Preferred Alternative following publication of the Draft RMPA/EIS, and determined that a new Alternative F would best protect threatened and endangered species critical habitat and other special management areas, while also meeting the Administration's energy development priorities.

That is, the Preferred Alternative was selected based on the Administration's goal of strengthening energy independence and the BLM support of an all-of-the-above energy plan that includes oil and gas underlying America's public lands. The Preferred Alternative fulfills FLPMA's mandate for multiple use and sustained yield of the BLM lands because it applies the least restrictions necessary to develop Federal minerals within existing oil and gas fields where the vast majority of oil and gas production is projected to occur. The Preferred Alternative includes NSO of Federal mineral estate within the Joaquin Rocks ACEC, within ACECs in the Ciervo-Panoche Natural Area and for giant kangaroo rate core population areas to avoid jeopardizing a core population of the giant kangaroo rat in the Planning Area. The Preferred Alternative directly supports the recovery plan for the species and may result in downlisting or delisting under the Endangered Species Act. The selection of Alternative F as Preferred Alternative reflects careful balancing of many competing public interests in managing public lands in accordance with the multiple use mandate and other obligations in FLPMA. It also is based on comprehensive environmental analysis and full public involvement in accordance with NEPA.

ES.9 Affected Environment

A detailed description of the affected environment within the CCFO Planning Area is presented in Chapter 3 (Affected Environment). The CCFO Planning Area encompasses about 6.8 million acres throughout San Francisco, Contra Costa, San Mateo, Alameda, San Joaquin, Santa Cruz, Santa Clara, Stanislaus, Monterey, San Benito, Merced, and Fresno Counties. Bounded by the Pacific Ocean to the west and the San Joaquin Valley to the east, elevations range from sea level to over 5,000 feet and major landforms include the Diablo Mountain Range, Salinas Valley, and San Joaquin Valley. Public lands are scattered across the Planning Area in numerous small parcels. This is a region of diverse topography and landscapes and extraordinary biodiversity.

Current oil and gas development is concentrated within a limited area of the CCFO Planning Area. In the last decade, nearly all well development occurred in the Coalinga and Jacalitos oil fields (Fresno County), and the San Ardo and Lynch Canyon oil fields (Monterey County). The Federal share of mineral estate in these fields is approximately nine percent (approximately 8,400 acres of Federal mineral estate out of

91,200 total acres), and as such, the BLM administers little of the mineral estate in this area. Likewise, the Vallecitos oil fields located in San Benito County have very little production that occurs on BLM-administered mineral estate. Exploratory oil wells are not common in the CCFO Planning Area, and historically have been drilled on less than five percent of the leases issued on BLM-administered mineral estate.

The biodiversity is reflected by 88 federally listed or candidate species or distinct population segments that occur within the Planning Area, including 46 plants and 42 animals. Critical habitat for 14 animal species and 13 plant species occurs within the Planning Area. There are 197 additional special status species (137 plant and 60 animal species) that occur within the Planning Area, and 129 of these are designated as BLM sensitive species (100 plant and 29 animal species).

There are a number of Special Management Areas within the CCFO Planning Area including two national monuments, two national trails, two research natural areas, and three areas of critical environmental concern. There are also three wilderness areas and five wilderness study areas.

The diverse land area managed by the CCFO encompasses a vast, cultural resource-rich portion of central California containing many hundreds of prehistoric archaeological sites reflecting an occupation of more than 6,000 years and a diversity of site types throughout the interior as well as along the coast. Though few studies have been conducted for land under the jurisdiction of the CCFO, a wealth of archaeological data has been collected from sites in the Southern Santa Clara Valley, the Monterey Bay area, and the western flanks of the San Joaquin Valley. Additionally, the CCFO Planning Area is underlain by many major significant fossil-bearing units.

Significant population growth is forecasted for all twelve counties. Active oil and gas wells on BLM-administered lands account for only 110 (0.6 percent) of the total 18,229 active wells within the CCFO Planning Area, of which BLM administers 793,000 acres of Federal mineral estate out of a total 6.8 million acres. With respect to the mineral extraction industry, Fresno and Monterey Counties contain the most active oil and gas wells within the CCFO Planning Area. While contributing significant labor earnings, the mineral extraction employment accounts for only a small percentage of the overall employment within each county.

ES.10 Environmental Consequences

Detailed descriptions of impacts of the five action alternatives are provided in Chapter 4 (Environmental Consequences), along with a discussion of the cumulative impacts. The analysis of all alternatives assumes up to 37 wells would be drilled resulting in an estimated 206 acres of ground disturbance.

Implementation of Alternative A would open the greatest number of acres of Federal mineral estate to potential oil and gas development. This alternative provides the most flexibility for oil and gas drilling. It would have the greatest potential for causing localized air quality impacts to sensitive receptors. The alternative could impact the largest number of groundwater basins assigned a high ranking priority and the largest number of watersheds. It is the least protective of biological resources and has the greatest potential for impacts to National Wild and Scenic Rivers.

Implementation of Alternative B would open the fewest acres of Federal mineral estate to potential oil and gas development. It provides the least flexibility for oil and gas drilling and would substantially limit future wildcat wells. It confines impacts to the public due to risk of upset to the smallest area and would likely have the shortest emergency response times. With Alternative E, it would impact the fewest groundwater basins assigned a high ranking priority and watersheds. It would have the potential to be inconsistent with fewer Visual Resource Management Class objectives and would have the least adverse effects to Special Management Areas and negligible impacts to National Wild and Scenic Rivers.

Implementation of Alternative C would balance open and closed acreages of Federal mineral estate, with almost the same amount of each. It provides more flexibility for oil and gas drilling than Alternatives B and D but less than Alternatives A, E and F. It is the most protective of threatened and endangered species critical habitat. It has the greatest potential for adverse effects to Special Management Areas.

Implementation of Alternative D would open the second fewest acres of Federal mineral estate to potential oil and gas development and would open no split estate lands, limiting the flexibility for oil and gas drilling. It is the most protective of the Ciervo-Panoche Natural Area and the special status species found in that region. It has no potential adverse effects from split estate lands but would limit some of the economic benefits of oil and gas development in certain areas.

Implementation of Alternative E would open the third highest number of acres of Federal mineral estate to potential oil and gas development and would prohibit oil and gas leasing inside of a California Department of Water Resources (DWR) Bulletin 118, Groundwater Basin or Sub-basin. It is the most protective for groundwater resources and with Alternative B, would impact the fewest number of watersheds. It has the potential to be inconsistent with the largest number of Visual Resource Management Classes, including Class I, the most protective class.

Implementation of Alternative F would have the same acreage of open and closed land as under Alternative A, but Alternative F would have 700 more acres of land subject to NSO stipulations. This alternative provides flexibility for oil and gas drilling and is consistent with the Administration's energy development priorities. With NSO stipulations, it would protect threatened and endangered species critical habitat and core populations of some listed species, such as giant kangaroo rat, but it would not have the same blanket protection of Federally listed species as under Alternative C. Impacts under Alternative F would be largely similar to Alternative A.

ES.11 Next Steps

Protests must be submitted electronically through the BLM ePlanning project website, or postmarked no later than 30 calendar days following publication of the U.S. Environmental Protection Agency's Notice of Availability in the Federal Register. If protests are received on the Proposed RMPA/Final EIS, they will be reviewed and addressed by the Director of the BLM before a Record of Decision and Approved Plan is released. See the Dear Reader letter for instructions on how to file a protest. The 30-day appeal period for the implementation decisions will begin upon signature of the ROD.

1. Introduction

The Bureau of Land Management (BLM) Central Coast Field Office[1] (CCFO) has prepared this Resource Management Plan Amendment and Environmental Impact Statement (RMPA/EIS) for oil and gas leasing and development to analyze the effects of alternative oil and gas management approaches on lands with Federal mineral estate within the CCFO Planning Area. The current management decisions for oil and gas resources are described in the Hollister Field Office Resource Management Plan for the Southern Diablo Mountain Range and Central Coast of California (BLM, 2007a). The BLM CCFO is making the Final EIS and Proposed RMPA on oil and gas leasing and development available in accordance with Executive Order 13783: Promoting Energy Independence and Economic Growth, signed March 28, 2017; along with Secretarial Order 3349: American Energy Independence, signed March 29, 2017.

Resource Management Plans (RMPs) are land use plans that establish goals and objectives for resource management and guide land management actions, which are based on the principles of multiple use and sustained yield. In keeping with the Administration's goal of strengthening America's energy independence, the BLM supports an all-of-the-above energy plan that includes oil and gas, coal, strategic minerals, and renewable sources such as wind, geothermal, and solar – all of which can be developed on public lands. America's free markets will help determine if energy development on public lands is feasible. Therefore, over time, decisions on how the land is managed need to be revised or amended to respond to new, intensified, or changed uses on public land, prompting an RMP revision or amendment. Here, a court order and settlement agreement have prompted the BLM to prepare this RMPA to the 2007 Hollister Field Office RMP. The court in *Center for Biological Diversity v. Bureau of Land Management* found it unreasonable for the BLM to "consider only a single exploratory well scenario solely based on past data" based on the record in the case.[2] In settlement of this and a related case, the BLM agreed to prepare an EIS addressing oil and gas development within the CCFO that includes analysis of two non-No Surface Occupancy (NSO) issued leases and 12 non-NSO prospective leases. In part, the BLM is preparing this EIS to consider impacts that may result from hydraulic fracturing and other well stimulation techniques.[3]

Stimulation, with respect to petroleum production, refers to a range of techniques designed to increase the permeability of the rocks through which oil or gas flows, thereby increasing the production of oil or gas from the reservoir. The most common types of stimulation are hydraulic fracturing, acid fracturing, and matrix acidizing. Since adopting the 2007 Hollister Field Office RMP, the BLM and the State of California have sponsored independent third-party extensive statewide studies of the geology of oil and gas basins and industry activities, including well stimulation treatments, such as hydraulic fracturing, acid matrix stimulation and acid fracturing.[4] These studies improve the understanding of past and present exploration and development in the CCFO Planning Area. An oil reservoir is considered to be unconventional if it requires the use of technology to increase hydrocarbon flow rate and/or reduce field viscosity to produce oil and gas at commercially economic rates (CCST, 2014, pg. 27). However, well stimulation can also be

[1] The Central Coast Field Office, currently located in Marina, California, was previously called the Hollister Field Office.

[2] 937 F. Supp. 2d 1140, 1156 (N.D. Cal. 2013).

[3] During the scoping period for this RMPA, the BLM received a number of comments from the public expressing concern about potential impacts from hydraulic fracturing (see Section 1.3). Although hydraulic fracturing has been used as a production stimulation method in California since the late 1960s and is considered a standard technique for production, analysis of potential impacts from hydraulic fracturing and other well stimulation techniques is included in this EIS due, in part, to the comments on this issue received during scoping.

[4] The California Council on Science and Technology (CCST) released its Independent Scientific Assessment (ISA) on Advanced Well Stimulation Technologies in California, commissioned by BLM, in August 2014 (CCST, 2014). In January 2015, the CCST released Volume I of the State's ISA of Well Stimulation in California, which was required by Senate Bill (SB) 4 (CCST, 2015a). CCST Volumes II and III were released in July 2015.

used to increase hydrocarbon flow rates even in otherwise commercial wells. The California Council on Science and Technology (CCST) reports are incorporated in this RMPA/EIS by reference and are briefly described in Section 4.1 (Introduction) (CCST, 2014; CCST, 2015a, CCST, 2015b, and CCST, 2015c).

To support the preparation of this RMPA, the BLM is completing an EIS that provides a comprehensive evaluation of the environmental issues and impacts associated with oil and gas leasing and development. The National Environmental Policy Act (NEPA) requires the BLM to consider a range of alternatives in its planning process and to analyze and disclose the potential environmental impacts of proposed RMPA decisions. The alternatives and impact analyses are documented in the EIS. The EIS impact analysis will also address the 14 leases within the CCFO Decision Area that do not contain NSO stipulations (i.e., non-NSO leases), per the July 2014 settlement agreement to resolve the disputes set forth in Case No. 11-06174 (Hollister I) and Case No. 13-1749 (Hollister II).[5]

This RMPA/EIS was prepared using the BLM's planning regulations (43 Code of Federal Regulations [CFR] Part 1600) and guidance issued under the authority of the Federal Land Policy and Management Act (FLPMA) of 1976. Section 102 of the FLPMA sets forth the policy for periodically projecting the present and future use of public lands and their resources through the use of a planning process. Sections 201 and 202 of the FLPMA are the statutory authorities for land use plans prepared by the BLM. The associated EIS is included in this document to meet the requirements of NEPA, the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR Parts 1500-1508), Department of the Interior (DOI) Implementation of the National Environmental Policy Act of 1969 Final Rule (43 CFR Part 46), and the requirements of BLM's NEPA Handbook H-1790-1 (BLM, 2008) and Land Use Planning Handbook H-1601-1 (BLM, 2005).

In the Federal Register notice initiating this planning process, the BLM indicated it may also use this process to consider amending RMPs for four other field offices in California with oil and gas leasing and development (Bakersfield, Palm Springs–South Coast, Mother Lode, and Ukiah Field Offices). The BLM considered public comments from scoping, the results of the CCST reports, and an internal evaluation of the RMPs for these five field offices to determine the proper geographic scope of this RMPA. The Mother Lode and Ukiah field offices were not included in this RMPA because their resources are primarily natural gas with an affected environment and environmental effects that differ substantially from the Central Coast Field Office. At the time the court remanded the 2007 Hollister Field Office RMP, the Bakersfield and South Coast RMPs were already under revision. The BLM determined that it was more appropriate to continue with the revised RMPs rather than initiate a new amendment for these plans during the active revision process. Because the Central Coast does have oil development potential and was not in the midst of a plan revision, the BLM determined that the Central Coast Field Office would be the appropriate geographic scope for this particular RMPA.

1.1 Purpose and Need for Amending the 2007 Hollister Resource Management Plan

The purpose of this amendment to the 2007 Hollister Field Office RMP is to determine which BLM-managed lands and subsurface Federal minerals are open or closed to oil and gas leasing, and which stipulations or restrictions apply to protect specific resources, based on an analysis of oil and gas exploration

[5] The *Center for Biological Diversity v. Bureau of Land Management* (Case No. 11-06174; Hollister I) decision found that the BLM violated NEPA when it failed to prepare an EIS prior to issuing two non-NSO leases. BLM has agreed to prepare an EIS to analyze and assess the adequacy of proposed stipulations for the two non-NSO leases referenced in Hollister I, and has suspended operations and production on those leases. The BLM has also agreed to not issue and to assess the adequacy of proposed stipulations for 12 prospective non-NSO leases identified in Case No. 13-01749 (Hollister II), pending completion of the EIS (*Center for Biological Diversity v. Bureau of Land Management*, 2014).

and development in excess of levels evaluated in the 2007 RMP. The RMPA would not authorize any actual drilling for exploration or development of oil and gas resources. Actual drilling authorization would be analyzed on a site-specific basis dependent on the project specifications before the BLM at that time.

In response to the Hollister litigation and settlement agreement, the court took issue with the BLM's conclusion that only one well would be drilled on BLM lands based on historical information and that the foreseeable development may be greater due to an increase in use of hydraulic fracturing and other well stimulation techniques. Therefore, the BLM developed a new Reasonably Foreseeable Development (RFD) Scenario focusing in detail on the current and future use of well stimulation technologies, including hydraulic fracturing, acid matrix stimulation, and acid fracturing, as well as future uses of enhanced oil recovery (see Appendix B). Because this new RFD Scenario forecasts a greater amount of development as compared to the RFD Scenario developed for the 2007 RMP, there is a need to consider whether the land use plan decisions in the 2007 RMP should be adjusted. An RMPA is also needed to address the current and potential future uses of well stimulation technologies, as well as future uses of enhanced oil recovery.

There is also a need to determine appropriate stipulations for the two suspended non-NSO leases referenced in Hollister I and the 12 prospective non-NSO leases identified in Hollister II.

Decisions to be made: Through the RMPA, the BLM will identify which lands are open or closed to oil and gas leasing and which stipulations would be applied on oil and gas exploration and development activities in order to protect environmental resources. For the 14 leases subject to the settlement agreement, BLM will determine by issuing a separate implementation decision whether the two non-NSO leases referred to in Hollister I should have been issued at all or whether stipulations should be added or revised, and whether the 12 prospective non-NSO leases referred to in Hollister II should be issued with revised or additional stipulations or if BLM should reject the bid and decline issuance of the leases.

1.2 Planning Area Description

The Planning Area is the geographical boundaries of the CCFO. This includes 6.8 million acres of Federal, State, and private lands across all or portions of the following 12 counties in western-central California:

- Alameda
- Contra Costa
- Fresno
- Merced
- Monterey
- San Benito
- San Francisco
- San Joaquin
- San Mateo
- Santa Clara
- Santa Cruz
- Stanislaus

The CCFO manages public land in 11 of these counties; there are currently no BLM-managed public lands in San Francisco County (see Figure 1-1). Public land parcels vary in size from less than 40 acres to more than 50,000 acres. The most notable holdings are located in the western San Joaquin Valley.

The Decision Area for the RMPA includes approximately 793,000 acres of BLM-administered subsurface mineral estate underlying public lands or split estate lands within the CCFO Planning Area boundary. Split estate means lands where the surface is owned by an entity or person other than the BLM but the Federal subsurface mineral estate is managed by the BLM. (Onshore Oil and Gas Order No. 1, part II). Split estate leases are included in the Decision Area and would be subject to the oil and gas resource management decisions of the RMPA. See Appendix G for further details. The BLM lands at the Cotoni-Coast Dairies unit of the California Coastal National Monument are not a part of the Decision Area because BLM does not manage the mineral estate underlying this unit of the Monument in Santa Cruz County.

1.2.1 Area Profile of Oil and Gas Development

Overall, there are five major sedimentary basins in California with reservoirs of known economically viable oil and gas resources: the Los Angeles, Ventura, Santa Maria, Salinas, and San Joaquin Basins. As shown on Figure 1-2 and 1-3, portions of the CCFO Planning Area are within the San Joaquin Basin in San Benito

and Fresno Counties and portions of the CCFO Planning Area are within the Salinas Basin in Monterey County. Figure 1-3 shows the plays and active oil and gas wells within the CCFO Planning Area.

Since 2002, well drilling activity in California has largely occurred outside of the CCFO Planning Area. Of the 12 counties in the CCFO Planning Area, six have had some well development activity since 2002 — Alameda, Contra Costa, Fresno, Monterey, San Benito, and Santa Clara. Existing wells are located on BLM-administered mineral estate in Contra Costa, Fresno, Monterey, San Benito, and Santa Cruz Counties. No wells are located on BLM-administered mineral estate in Alameda, Merced, San Francisco, San Joaquin, San Mateo, Santa Clara, or Stanislaus Counties. In general, most of the new well activity in the CCFO Planning Area occurs in the eastern portion of the area (i.e., over 97 percent of all well development since 2002 occurred in four fields in Fresno and Monterey Counties).

As of mid-2014, there were 65 authorized oil and gas leases on Federal mineral estate within the CCFO Decision Area, covering approximately 41,200 acres. Eighty (80) actively producing oil and gas and service wells and 66 idle wells were located on Federal mineral estate within the CCFO Decision Area. To date, over 99 percent of the wells in the CCFO Planning Area continue to be located within oil and gas field boundaries, with less than 1 percent being classified as wildcats (outside administrative field boundaries[6]). Of the approximately 4,292 producing and service wells within the CCFO Planning Area, the estimated 146 wells that occur on Federal authorized leases amount to BLM involvement with 3.4 percent of all current oil and gas activity within the CCFO Planning Area boundary.

1.2.2 Planning Process for Leasing and Development

Under FLPMA Section 102, the BLM is required to manage the public lands on the basis of multiple use and sustained yield and to meet the needs of present and future generations. The BLM uses an ongoing planning process to ensure that land use plans and implementation decisions remain consistent with applicable laws, regulations, orders, and policies. Modifying land use plans through maintenance and amendment on a regular basis reduces the need for major revisions of land use plans (BLM, 2005).

Oil and gas leasing and development on Federal mineral estate requires multiple stages of BLM authorization. Environmental review under NEPA may be required at each phase. The RMPA will identify areas as open or closed to fluid mineral leasing and specify appropriate stipulations for those areas identified as open. At the leasing stage, the BLM identifies which parcels should be offered for leasing and the conditions under which leasing and eventual development should occur. The review for the development of leased parcels (including well stimulation techniques) is a site-specific analysis of potential impacts from the proposed project and includes specific conditions of approval to avoid, minimize, or mitigate impacts to sensitive resources.

Leasing

Parcels that are nominated for leasing must be reviewed and approved by the BLM prior to leases being sold at an auction. This review is conducted and documented in accordance with NEPA. The purpose of lease parcel review by the field office is to determine whether a parcel should be offered for leasing, and if so, the conditions under which leasing and eventual development should occur. The CCST reports, and future information developed about oil and gas extraction and well stimulation technology in California, would be considered during the State Director review of parcels to offer for lease. During this review, the BLM will consider the likelihood that the parcels nominated for leasing may require the use of well stimulation technologies. The BLM's associated environmental review documents would disclose the impacts and risks of well stimulation technology based on the best available information at the time, and

[6] An oil and gas field is a geographical area under which an oil or gas reservoir lies. Oil and gas field boundaries are defined by the California Division of Oil, Gas and Geothermal Resources (DOGGR). Administrative field boundaries are drawn on section or quarter-section lines and incorporate all producing wells within a field.

how those risks can be avoided, minimized or mitigated through the application of Best Management Practices (BMPs) and Conditions of Approval (COAs). Upon completing this review, the State Director will determine whether to offer the parcel for lease, and if so, what stipulations, COAs, and BMPs to attach to the lease.

Development

Onshore Oil and Gas Order Number 1 requires Federal oil and gas operators to conduct operations to minimize impacts to surface and subsurface resources, prevent unnecessary surface disturbance, and conform to currently available technology and practice. Per Onshore Order Number 1, BLM may approve, defer, or deny an Application for Permit to Drill. Drilling and abandonment activities must adhere to the provisions and standards of Onshore Oil and Gas Order Number 2 to protect subsurface resources. Onshore Oil and Gas Order Number 7 provides the methods and approvals necessary to dispose of produced water associated with oil and gas operations.

Measures to avoid, minimize, or mitigate impacts, in addition to those identified in the Onshore Oil and Gas Orders and the regulations in 43 CFR 3160, are incorporated into the RMP as Standard Operating Procedures (SOPs) and BMPs. Examples of these measures include: reducing the area of disturbance to the smallest practical area and using previously disturbed areas to the extent practicable; setting and cementing surface casings to sufficient depths to protect usable water bearing zones; using a closed-loop drilling system to reduce water usage; and placement of production facilities and equipment to maximize interim reclamation. In addition, every permit approval includes a list of COAs that are tailored to the specific location and type of activity being approved. When the BLM receives applications to conduct activities on leases (e.g., applications for permits to drill or sundry notices of intent), additional NEPA analysis may be required. During this site-specific, implementation-level analysis, the BLM may consider additional mitigation measures to address any anticipated impacts, including those from well stimulation techniques.

In addition, oil and gas operators must comply with both Federal and State statutes and regulations to the extent that State regulations are consistent with Federal law and Federal lease rights. Therefore, depending on the activity, applications to conduct oil and gas activities on BLM leases in the CCFO Planning Area would also require approval from DOGGR in accordance with Title 14 California Code of Regulations (14 CCR) Sections 1712 and 1714, among others.

1.2.3 Monitoring, Evaluation, and Adaptive Management

Once the BLM approves a land use plan or amendment, it must monitor and periodically evaluate the land use plan decisions. The BLM's Monitoring and Evaluation process is described in more detail beginning on page 32 of the BLM Land Use Planning Handbook (H-1610-1) (BLM, 2005).

As part of the implementation of the oil and gas decisions in this amendment, and standard land use planning monitoring and evaluation, the BLM will periodically consider whether planning decisions remain relevant or if the BLM should consider new planning decisions in light of changed circumstances or new information.

1.3 Scoping/Issues

Scoping is the term used in the CEQ regulations implementing NEPA (40 CFR 1500 et seq.) to define the early and open process for determining the scope of issues to be addressed in the planning process. The formal public scoping period for the RMPA/EIS began on August 5, 2013, with the publication of a Notice of Intent (NOI) in the Federal Register, and ended on February 28, 2014. Four scoping public meetings were held in January and February 2014 in Hollister, Sacramento, Salinas, and Coalinga, California. The BLM reviewed and categorized the public scoping letters and used the planning issues raised in the scoping

comments to help guide the development of the range of alternative management strategies for the RMPA. For a detailed description of the scoping process and the public outreach efforts, please refer to the Scoping Summary Report (see Appendix E). BLM also held a Social and Economic Workshop on February 4, 2015, to solicit input on the effects the proposed RMPA may have on local economic and social goals in the CCFO Planning Area, which was documented in a Social and Economic Workshop Summary Report (see Appendix F).

1.3.1 Issues Addressed

In its Scoping Summary Report, the BLM grouped the issues identified during scoping into comments pertaining to specific resource areas, comments pertaining to alternatives, and general comments that were not resource-specific. Issues were raised in the Social and Economic Workshop Summary Report as well. The issues identified as being within the scope of the RMPA/EIS are included in the Scoping Report (Appendix E) and Social and Economic Workshop Summary Report (Appendix F).

1.3.2 Issues Considered but Not Further Analyzed

Comments Addressed Through Policy, Regulatory, or Administrative Actions

Policy or administrative actions include those actions that are implemented by the BLM because they are standard operating procedure, because Federal law requires them, or because they are BLM policy. They are issues that are eliminated from detailed analysis in this planning effort. Administrative actions do not require a planning decision to implement because they are a requirement of Federal law or BLM policy. The following issues raised during scoping are already addressed by administrative actions:

- BLM agreed to halt oil and gas leases on Federal land in the CCFO Decision Area, but left unclear whether it would end the moratorium in the future; the moratorium should remain in place.
- BLM should complete the NEPA analysis in as timely and efficient a manner as possible.
- BLM should follow the authority the Congress delegated to Environmental Protection Agency (EPA) and the State of California under the Clean Air Act.
- New wells should be allowed in California's public lands until a Final EIS is completed.
- Identify how areas might be selected as suitable for oil and gas leasing, why and based upon what principles such determinations will be made, and if the information used to make these decisions is consistent with the fundamental issues defined by NEPA.

Comments Not Addressed in the RMPA/EIS

Consistent with the purpose of this action, issues addressed in this RMPA/EIS are those that deal specifically with the effects of alternative oil and gas management approaches on lands with Federal mineral estate within the CCFO Planning Area. Other topics that could be relevant to other planning issues within the CCFO Planning Area are not addressed in this RMPA/EIS. Examples of issues or topics not addressed in this RMPA/EIS include, but are not limited to:

- The EIS and the statewide study should assess the impact of refining and burning the newly accessible supply of oil and gas.
- BLM should conduct an EIS for all BLM-administered lands and sub-surface resources in California, analyzing both its oil and gas leasing practices and the full extent of its associated impacts, rather than limiting the scope to the area under the management of the Central Coast Field Office.
- The alternatives to the project analysis should include a review of the potential for wind and solar power development, including where, how, and with what limitations.

1.4 Planning Criteria

An RMP inventories the natural resources and analyzes the socioeconomic environment associated with a planning area (43 CFR 1610.4-4), while a plan amendment is a modification of one or more parts of an existing RMP (e.g., management of oil and gas resources). The planning criteria for this planning effort are that the RMPA will:

- Recognize valid existing rights;
- Retain the existing resource condition goals and objectives in the 2007 Hollister RMP except for Energy and Minerals which have been updated;
- Analyze impacts to areas that are currently open to leasing and will not consider opening areas to leasing that are currently closed;
- Comply with FLPMA, NEPA, and all other Federal laws, executive orders, and management policies for the BLM;
- Seek public input;
- Consider adjoining non-public lands when making management decisions to minimize land use conflicts;
- Consider the planning jurisdictions of other Federal agencies and State, local and tribal governments;
- Develop a reasonable range of alternatives;
- Use current scientific data to evaluate appropriate management strategies; and
- Analyze the socioeconomic effects of alternatives along with the environmental effects.

1.5 Planning Process

When developing or amending an RMP, the BLM uses a nine-step planning process identified in 43 CFR 1600 and the BLM Land Use Planning Handbook (BLM, 2005). The steps in the nine-step planning process are the same for developing a plan amendment as they are for developing an RMP. After the Proposed RMPA/Final EIS is published and made available for public review for 30 calendar days. A ROD is signed to approve the RMPA. The final step is implementation and monitoring where management measures outlined in the approved plan amendment are implemented, and future monitoring is conducted to test their effectiveness. Changes are made as necessary to achieve the desired results.

1.5.1 Relationship to BLM Policies, Plans, and Programs

This RMPA focuses on the management of oil and gas resources on BLM-administered mineral estate within the CCFO Decision Area. While this RMPA will update the energy and minerals decisions in the CCFO, the existing 2007 Hollister RMP will continue to guide the non-energy related management decisions of public lands within the CCFO Decision Area.

Table 1-1 highlights some of the major plans and policies that have led to the present management of the CCFO Planning Area.

Table 1-1. Existing Management Plans for the Central Coast Field Office

Document Title	Year
BLM Wilderness Recommendations, Central California Study Areas, Final EIS	1987
BLM Wilderness Recommendations, Central California Section 202 WSA, Final EIS	1987
Juan Bautista de Anza National Historic Trail Comprehensive Management Plan/Final EIS	1996

Table 1-1. Existing Management Plans for the Central Coast Field Office

Document Title	Year
Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California	1997
California Coastal National Monument RMP	2005
Southern Diablo Mountain Range and Central Coast California Approved RMP and Record of Decision	2007
Record of Decision for the Clear Creek Management Area RMP	2014

The preceding plans are incorporated in this RMPA/EIS by reference but are not included herein. They are briefly described in Chapter 2 and Chapter 3 as appropriate. Other plans, policies and programs that apply to BLM land use planning in general are included in the 2007 RMP.

1.5.2 Collaboration with Agencies and Tribes

Federal, State, Local Governments

The RMPA allows the BLM the opportunity to review agreements that currently exist with other Federal, State, or local agencies, and collaborate with new partners to improve management of public land resources in the Planning Area. A description of Consultation and Coordination efforts can be found in Chapter 6.

2012 BLM Memorandum of Understanding with California Department of Conservation

BLM California's 2012 Memorandum of Understanding (MOU) with the California Department of Conservation encourages and facilitates sharing information and combining resources where possible. BLM California and the State of California have agreed to cooperatively implement oil and gas field regulations on Federal mineral estate and coordinate development and implementation of future hydraulic fracturing and cyclic steaming regulations. In the MOU, the two agencies lay out their respective roles for regulating oilfield operations on BLM-administered lands. The MOU provides that, on Federal mineral estate, DOGGR is responsible for regulating well operations and appropriate surface facilities for the protection of hydrocarbon reservoirs, groundwater, and health and safety.

Tribal Relationships

During the development of this RMPA/EIS, the BLM initiated consultation with 28 tribal individuals or organizations, and one Federally recognized Tribe, the Santa Rosa Rancheria of Tachi Yokuts Tribe, identified as having interests in the Planning Area. The Ohlone/Costanoan-Esselen Nation was the only Tribe that responded and indicated a desire for consultation on any planned projects that may adversely impact known or predicted cultural resources and sacred sites within the Tribe's aboriginal territory. Government-to-government consultation with the Federally recognized Santa Rosa Rancheria of Tachi Yokuts Tribe will continue to ensure that the concerns of tribal groups are considered in development and implementation of the RMPA.

1.6 Related Federal and State Laws

A broad range of Federal and State laws guide development of the RMPA. Key laws with bearing on the planning decisions are discussed in Appendix J.

1.7 Changes Between Draft RMPA/EIS and Proposed RMPA/Final EIS

As a result of public comments, updated information, changes in policies or priorities, and internal review, the following revisions have been made in this Proposed RMPA/Final EIS since publication of the Draft RMPA/EIS in January 2017:

- Addition of Alternative F throughout the Proposed RMPA/Final EIS, including associated figures in Appendix A
- Identification of Alternative F as the Preferred Alternative in the Proposed RMPA/Final EIS
- Update of applicable Federal policies
- Removal of reference to the rescinded BLM 2015 Final Rule on Hydraulic Fracturing on Federal and Indian Lands from the Proposed RMPA/Final EIS
- Additional discussion of the 2012 BLM Memorandum of Understanding with California Department of Conservation, and clarification of State regulations that oil and gas operators must comply with both Federal and State statutes and regulations to the extent that State regulations are consistent with Federal law and Federal lease rights
- Removal of discussion of potential expansion of the Panoche-Coalinga ACEC in southern San Benito and western Fresno Counties, as it is no longer under consideration
- Additional discussion and tables acreages and legal descriptions of the 14 leases subject to the settlement agreement
- Identification of lands with wilderness characteristics and an analysis under Special Management Areas of how they would be affected by BLM's oil and gas leasing and development program in the CCFO Planning Area
- Addition of a cultural mitigation measure regarding the Juan Bautista de Anza National Historic Trail
- Revised Appendix C to add Mitigation Measures and to ensure consistency with administration's policy regarding compensatory mitigation (IM 2018-093)
- New Appendix H, Public Meetings Summary Report
- New Appendix I, including all the comments and responses to comments on the Draft RMPA/EIS
- New Appendix J, Regulatory Framework
- New Appendix K, Air Quality Technical Support Document (BLM, 2019)
- New Appendix L, Special Status Species
- New Appendix M, Paleontology
- Revisions to meet the intent of Secretarial Order 3355 (NEPA Streamlining)

As described above, throughout the development of the Proposed RMPA/Final EIS, editorial changes were made to improve clarity, and technical changes were made to correct errors. New information on resources or resource uses was added. New or rescinded program policies were updated.

The NEPA requires agencies to prepare a supplement to the Draft RMPA/EIS if: (1) the agency makes substantial changes in the proposed action that are relevant to environmental concerns; or (2) if there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. A supplement is not necessary if a newly formulated alternative is a minor

variation of one of the alternatives and is qualitatively within the spectrum of alternatives analyzed in the Draft RMPA/EIS.

Incorporation of Alternative F into the Proposed RMPA includes components of the alternatives analyzed in the Draft RMPA/EIS. Taken together, these components present a suite of management decisions already analyzed namely in Alternative A of the Draft RMPA/EIS and are qualitatively within the spectrum of alternatives analyzed. Specifically, Alternatives A and Alternative F would designate the same lands as open and closed to oil and gas leasing and development. Alternatives A and D apply NSO stipulations to ACECs, which would include the ACECs specified under Alternative F, and Alternative C applies NSO stipulations to critical habitat for federally-listed species, including the giant kangaroo rat.

Therefore, the BLM has determined that the Proposed RMPA is a minor variation of identified alternatives and that its impacts would not affect the human environment in a substantial manner or to a significant extent not already considered in the EIS. The impacts disclosed in the Proposed RMPA/Final EIS are similar or identical to those described in the Draft RMPA/EIS.

1.8 Overall Vision

The overall vision of the RMPA planning effort is to provide a collaborative community-based planning approach to update the existing management decisions and resource allocations for oil and gas leases by addressing new data, changing resource conditions, and changes in the use of public land that have occurred since the 2007 Hollister Field Office RMP was completed.

2. Alternatives

2.1 Introduction

Chapter 2 describes the six alternatives evaluated in detail in the Central Coast Oil and Gas Leasing and Development Resource Management Plan Amendment (RMPA)/Environmental Impact Statement (EIS), which includes the No Action Alternative (Alternative A) and five action alternatives (Alternatives B, C, D, E, and F). Section 2.2 explains how the alternatives were developed. Sections 2.3 and 2.4 describe the Reasonably Foreseeable Development (RFD) Scenario as well as management goals, objectives and actions common to all alternatives. The six alternatives are described in Sections 2.5 through 2.11 and are depicted on figures provided in Appendix A. Section 2.12 presents a detailed comparison of the six alternatives. Finally, the alternatives that were considered but eliminated from detailed analysis are described in Section 2.13. Alternatives were eliminated if they did not meet the purpose and need for the RMPA/EIS, were covered under alternatives analyzed in this RMPA/EIS, or if they were not feasible due to technical, legal, or policy considerations.

Analysis of each alternative has been reviewed and has guided the BLM in selecting Alternative F as the Preferred Alternative (40 CFR Part 1502.14 (e)) and the basis of this Proposed RMPA. This is not a final agency decision, but instead an indication of the agency's preliminary preference. The Proposed RMPA reflects changes or adjustments based on public comments, new information, and changes in BLM policies or priorities. That is, the Preferred Alternative was selected based on the Administration's goal of strengthening energy independence and the BLM support of an all-of-the-above energy plan that includes oil and gas underlying America's public lands. The Preferred Alternative fulfills FLPMA's mandate for multiple use and sustained yield of the BLM lands because it applies the least restrictions necessary to develop Federal minerals within existing oil and gas fields where the vast majority of oil and gas production is projected to occur. The Preferred Alternative includes NSO stipulations on 42,400 acres of Federal mineral estate in the Joaquin Rocks ACEC, ACECs within the Ciervo-Panoche Natural Area and in core population areas of the giant kangaroo rat to avoid jeopardizing a core population of the giant kangaroo rat and directly impacting other sensitive biological and cultural resources. The Preferred Alternative directly supports the recovery plan for the species and may result in downlisting or delisting under the Endangered Species Act. The selection of Alternative F as Preferred Alternative reflects careful balancing of many competing public interests in managing public lands in accordance with the multiple use mandate and other obligations in FLPMA. It also is based on comprehensive environmental analysis and full public involvement in accordance with NEPA.

Acreages presented for each alternative have been calculated using BLM Geographic Information System (GIS) data; the results may differ from the 2007 Hollister Field Office RMP due to advancement of GIS technology, refinement in the precision of the mapping of various datasets over time, variations in the selection of data sets utilized for calculations, and refinement of the oil and gas occurrence potential in the CCFO Planning Area. Mineral estate lands managed by BLM are also subject to change due to acquisitions and/or disposal and data refinement and maintenance. Total calculated acres do not represent site specific areas and are for generalized planning purposes only.

2.2 Alternatives Development

The BLM used several sources of input to develop alternatives, including existing decisions in the 2007 Hollister Field Office RMP and the 2015 RFD Scenario. The public scoping process, conducted from August 5, 2013, to February 28, 2014, provided an opportunity for interested members of the public, local governments, and other resource and land management agencies to comment on the planning process and/or management concerns for oil and gas resources. From the comments received, the BLM identified the key planning issues to be addressed in the Draft RMPA/EIS and incorporated them into the range of alternatives. BLM also held a Social and Economic Workshop on February 4, 2015, to solicit input on the effects Federal

mineral leasing and development may have on local economic and social goals in the CCFO Planning Area, which was documented in a Social and Economic Workshop Summary Report (Appendix F).

Following public review and comments on the Draft RMPA/EIS, the BLM determined it was necessary to include and analyze Alternative F to address unresolved issues and meet the agency's mandate for energy development.

2.3 Reasonably Foreseeable Development Scenario

In 2015, the BLM prepared an updated RFD Scenario to project the levels and types of industry activity and the associated surface disturbance that are likely to occur on all mineral estate managed by the BLM in the CCFO Planning Area (see Appendix B). The 2015 RFD Scenario is based on known or inferred oil and gas occurrence potential based on California Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR) records, independent assessments of scientific literature, and knowledge of local experts with experience in the leasing and development of Federal minerals. The lands included are limited to those with BLM-administered mineral estate, including split estate where the surface is owned by an entity or person other than the BLM, but the Federal subsurface mineral estate is managed by the BLM. The 2015 RFD Scenario is a planning tool to help the BLM project the reasonably foreseeable impacts of oil and gas development within the Planning Area since that development has not yet occurred. It is an educated forecast of possible future development and does not, in and of itself, represent a decision to authorize oil and gas development, nor is it a goal or target for oil and gas development in the Planning Area. Therefore, it establishes a common basis upon which BLM will analyze the impacts of all alternatives, including the No Action Alternative.

An RFD is used to project management activities and actions which are likely to occur in the planning area over the life of the plan assuming all potentially productive areas are open under standard lease terms and conditions. (BLM Handbook, H-1624-1 Planning for Fluid Mineral Resources, Chp. III.; Instruction Memorandum No. 2004-089 "Policy for Reasonable Foreseeable Development (RFD) Scenario for Oil and Gas," January 16, 2004.) Existing fluid minerals practices, including well stimulation techniques and enhanced recovery methods, and information on existing leases and related exploration and development activities as well as the potential for development in the planning area provide the basis for projecting the RFD. The RFD evaluated areas with similar exploration and development potential, the number, density and type of wells likely to be drilled within these areas, and the estimated percent of activity that is likely to occur on land managed by the BLM. Projections to evaluate what future oil and gas exploration or development may be reasonably expected are based on past and present leasing, exploration, and development activity as well as professional judgment on geological and related technological and economic factors.

The BLM has specifically identified the potential use of enhanced production and well stimulation techniques in the 2015 RFD Scenario for the Central Coast RMPA. The 2015 RFD Scenario considers oil and gas technologies, including well stimulation, enhanced oil recovery techniques, and recent oil and gas development trends in California. Based on further analysis of the geology of the area and updated information, the 2015 RFD Scenario also modifies the areas of oil and gas occurrence potential that were identified in the 2007 Hollister Field Office RMP (BLM, 2007; Appendix F).

Overall, the 2015 RFD Scenario assumes that the current development trends in this region are likely to continue for the next 15 to 20 years. Fewer than one percent of the wells counted in the CCFO Planning Area occur outside of existing administrative oil and gas field boundaries.[1] The RFD estimates that during the life of this plan, between zero and 32 development wells could be expected on Federal mineral estate

[1] An oil and gas field is a geographical area under which an oil or gas reservoir lies. Oil and gas field boundaries are defined by the California Division of Oil, Gas and Geothermal Resources (DOGGR). Administrative field boundaries are drawn on section or quarter-section lines and incorporate all producing wells within a field.

within existing fields[2] in the CCFO Decision Area and three to five exploratory wildcat wells[3] (wells outside of the administrative boundary of existing oil and gas fields) would be drilled on Federal mineral estate in the CCFO Decision Area. Therefore, given the limited extent of area of Federal mineral estate within the entire Planning Area (approximately 793,000 acres of Federal mineral estate out of 6.8 million acres in the Planning Area), it is unlikely that more than a total of 37 new exploratory and development wells will be drilled on new or existing Federal oil and gas leases over the next 15 to 20 years. For the purpose of analysis, well stimulation technologies and enhanced oil recovery techniques are assumed to be used on any or all of these wells (Appendix B); however, since 2002, only 2.5 percent of the wells within the CCFO Planning Area boundaries have record of being hydraulically fractured. While the large majority or even all of this activity is expected to occur in areas identified in this RFD Scenario as "high oil and gas occurrence potential," it is possible other areas may see geophysical exploration, leasing and development. It is highly unlikely, although not impossible, that any wells in such an area would be productive, so any associated surface disturbance would likely be short-term. The total surface disturbance caused by all seismic operations, exploration drilling, and well development on Federal mineral estate would be up to approximately 206 acres (see Appendix B, sec. 5). For the purposes of this RMPA/EIS, all mineral estate managed by the BLM is considered covered by the 2015 RFD Scenario, even if not currently mapped. Mineral estate on lands that may be acquired in the future is also covered by the 2015 RFD Scenario, so long as the values and resources that are contained on the newly acquired lands do not differ significantly from other Federal mineral estate nearby.

2.4 Management Common to All Alternatives

The alternatives described in this chapter represent a range of management options to address the scoping issues (presented in Section 1.3) and to achieve resource management goals in light of the updated oil and gas RFD Scenario in the CCFO Planning Area. This section discusses the management goals, objectives, and actions that would apply to CCFO management of oil and gas resources under all alternatives, as well as California Department of Oil, Gas, and Geothermal Resources (DOGGR) regulations under Senate Bill 4 (SB4).

All areas currently closed to leasing under the 2007 Hollister Field Office RMP would remain closed under all alternatives. The specific goals, objectives and management actions that would apply to CCFO management of oil and gas resources under each individual alternative are listed in Sections 2.6 through 2.11.

2.4.1 Management Goals and Objectives

The 2007 HFO RMP defined management goals and objectives for each resource and resource use category that the BLM must address in the planning process (BLM, 2007). These management goals and objectives have been incorporated, or updated, to apply to oil and gas leasing under this RMPA/EIS.

The goal for energy and mineral resource management is to allow development of energy and mineral resources to meet the demand for these resources while protecting natural and cultural resources in the area.

To achieve this goal, the following objectives related to oil and gas leasing and development would be established:

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[2] The RFD assumes that the federal share of development is likely to remain roughly proportional to the federal share of mineral estate in the four most-active fields (1 percent).

[3] The past trend indicating only one percent of wells are outside administrative field boundaries implies that roughly 32 exploratory wells would be drilled on lands within the CCFO Planning Area. Given that 11.6 percent of land in the planning area is Federal mineral estate, 3 to 5 exploratory wildcat wells would be drilled on Federal mineral estate in the CCFO Planning Area during the life of this plan.

- Balance responsible mineral resource development with the protection of other resource values;
- Provide opportunities for mineral exploration and development under the mining and mineral leasing laws; and
- Provide mineral materials needed for community and economic purposes.

2.4.2 Management Actions

The BLM management actions for energy and minerals that are common to all alternatives are listed below. In order to manage oil and gas leasing and development within the CCFO Planning Area, the BLM established the following management actions in the 2007 RMP:

- **ENERG-COM1.** As outlined in the BLM Manual 6330 – Management of Wilderness Study Areas (BLM, 2012) and the Wilderness Act of 1964, WSAs and Wilderness Areas would be closed to mineral leasing and sales and to locatable mineral activities that require reclamation or degrade wilderness values.
- **ENERG-COM4.** Make all BLM public lands, unless withdrawn or otherwise noted, available for energy and mineral development subject to BLM's Fluid Minerals BMPs.
- **ENERG-COM5.** Consider energy and minerals exploration, development, and production within environmental and multiple-use management constraints.
- **ENERG-C4.** Leases would be subject to standard stipulations and mitigation measures for special status species (BLM, 2007; Appendix D).

As part of establishing the Fort Ord National Monument in 2012, the presidential proclamation withdrew Fort Ord from mineral entry. As such, the following new management action common to all alternatives would also be established in addition to those established in the 2007 RMP:

- **ENERG-A1.** Fort Ord National Monument would be closed to mineral leasing.

In order to manage oil and gas leasing and development within the Clear Creek Management Area, the BLM established the following management actions in the 2014 RMP:

- **ENERG-DEF1.** Allow no mineral leasing or sales on public lands in the Serpentine ACEC.

2.4.3 Best Management Practices

Best Management Practices (BMPs) are measures applied to oil and natural gas drilling and production to help ensure that energy development is conducted in an environmentally responsible manner. BLM incorporates appropriate BMPs into Applications for Permit to Drill as Conditions of Approval and associated on- and off-lease rights-of-way approvals. BMPs are dynamic, evolving through new understanding and developments in science and technology. They are selected and implemented as necessary, based on site-specific conditions, to meet resource objectives for specific management actions. New information and improving technologies will likely lead to the development of new or revised measures over time (BLM, 2015). For all alternatives, the BLM would apply and use BMPs (see Appendix D), as needed in specific situations, to ensure adequate protection of resource values. "BMPs are voluntary unless they have been analyzed as a mitigation measure in the environmental review for a Master Development Plan, Application for Permit to Drill (APD), Right-of-Way, or other related facility "permit" and included as a Condition of Approval" (43 CFR 3164.1, Onshore Oil and Gas Order No. 1, Approval of Operations [2007]).

By reducing the area of disturbance, adjusting the location of facilities, and using numerous other techniques to minimize environmental effects, BMPs reduce impacts associated with new energy development to wildlife habitat, scenic quality, water quality, recreation opportunities, and other resources. The actual practices and mitigation measures best for a particular site are evaluated through the NEPA process accommodate unique, site-specific conditions and local resource conditions.

2.4.4 DOGGR Senate Bill 4 Regulations

On public lands, including those covered by the RMPA, oil and gas operators must comply with both Federal and State statutes and regulations to the extent that State regulations are consistent with Federal law and Federal lease rights. In California, the relevant State law includes hydraulic fracturing regulations promulgated under California's Senate Bill 4 (SB 4).[4] As discussed below, SB 4 provides for reductions in the risks present with hydraulic fracturing operations. SB 4 addresses well stimulation requirements, including hydraulic fracturing requirements.

BLM's Instruction Memorandum (IM) No. CA-2014-031 supplements existing BLM policy and guidance regarding APDs and Sundry Notices (SNs) in California. That IM directs BLM California to adhere to the same data requirements as the State of California with respect to well stimulation techniques, including hydraulic fracturing. According to the IM, before an operator may conduct well stimulation activities on Federal mineral estate, a copy of the State permit application and groundwater monitoring plan (if applicable) required by SB 4 is to be submitted to the BLM along with the APD or SN. The operator should also follow up with copies of the final State-approved permits that show any modifications to the original application. The information contained in the application and the final State-approved permit will be used to inform the BLM's NEPA analysis regarding the effects of well stimulation. BLM's NEPA analysis will provide the basis for modification or application of conditions of approval regarding the proposed operation.

BLM California's 2012 Memorandum of Understanding with the California Department of Conservation encourages and facilitates sharing information and combining resources where possible. BLM California and the State of California have agreed to cooperatively implement oil and gas field regulations on Federal mineral estate to the extent they are applicable. A summary of SB 4 regulations is provided in Appendix J.

Discussion of SB 4 as it relates to impacts to specific resources from hydraulic fracturing can be found in the discussions under geology, hazardous materials and public safety, groundwater, and surface water of this RMPA/EIS. The potential impacts of oil and gas development, including from hydraulic fracturing, are evaluated in this EIS. SB 4 and the BLM California water stipulation have been incorporated into the analysis of effects and mitigation measures in Chapter 4 of this EIS. This EIS analyzes those impacts at a programmatic scale. However, it is important to note that the effect of any particular well or field development would depend on the impact posed by site-specific engineering and operations within specific geology and upon the area's other characteristics (such as nearby wellbores). The BLM will analyze these site-specific impacts during the NEPA review for a lease or an individual well.

2.5 Overview of the Proposed RMPA Alternatives

2.5.1 Allowable Uses

The six alternatives are distinguished by the type and degree of constraints described as allowable uses undertaken to achieve the desired outcomes. Allowable uses identify surface lands and Federal subsurface oil and gas mineral estate where uses are allowed. Allowable uses include any protective measures or restrictions that would be needed to meet desired outcomes and could exclude certain land uses to protect resource values. For example, protective measures could be imposed on the location of access roads, well sites, and facility sites or on the timing of geophysical exploration, well drilling, or other operations, consistent with the mineral rights granted by the lease. Allowable uses could be restricted by lease stipulations (e.g., lands open to leasing with a NSO stipulation), conditions of approval (COAs) from the surface management agency's review and environmental analysis of the proposed operations, Notices to Lessees, Onshore Orders, or regulations. Protective measures are used to further define allowable use and are identified by the specific resource value or use under consideration.

[4] The final regulations promulgated under SB 4 amend sections of California Code of Regulations Title 14, Division 2, Chapter 4, Subchapter 2.

An explanation of the general types of lease stipulations is included below. The lease stipulations specific to each alternative in this RMPA/EIS are described in Sections 2.6 through 2.11 and listed in Appendix C of this RMPA/EIS. Lease stipulations are applied to Federal leases, including split estate leases.

Lease Stipulations

Lease stipulations are necessary "if upon weighing the relative resource values, there are values, uses, and/or users identified that conflict with oil and gas operations and cannot be adequately managed and/or accommodated on other lands" (U.S. Government, 1989). BLM policy is to apply the least restrictive stipulation necessary to adequately protect the identified resource value(s). There are three general types of stipulations that may be applied to a lease (BLM, 2013; U.S. Government, 1989):

- **Controlled Surface Use (CSU):** Special operational constraints that may modify lease rights are applied to allowed use and occupancy while protecting identified resource values.

  Example: No permanent facilities or structures within 2 miles of a raptor nest.

- **Timing Limitation (TL) (Seasonal Restriction):** Surface use is prohibited during specified time periods to protect identified resource values.

  This stipulation does not apply to the operation and maintenance of production facilities unless the findings of analysis demonstrate the continued need for such mitigation and that less stringent, project-specific mitigation measures would be insufficient.

  Example: In habitat for raptor species, no surface disturbances would be conducted during the breeding and nesting season (March 1 to August 31 for burrowing owl and March 1 to August 1 for ferruginous hawk) within established spatial buffers (0.25 miles for burrowing owl and 0.5 miles for ferruginous hawk) of known nesting sites.

- **No Surface Occupancy (NSO):** Use or occupancy of the land surface for fluid mineral exploration or development is prohibited to protect identified resource values.

  In order for lands to be leased subject to a NSO stipulation, there must be potential for the minerals under the NSO lands to be developed from nearby lands by directionally or horizontally drilling. If the minerals under the NSO land cannot be developed from nearby lands and there is no less restrictive stipulation that would protect the resource values, then the lands should be closed to leasing.

  Example: All river corridors recommended as Wild and Scenic would be NSO for oil and gas leasing.

The circumstances for granting an exception, modification, or waiver to the specific lease stipulations included in this RMPA/EIS are documented in Appendix C. An *exception* is a one-time exemption to a lease stipulation, determined on a case-by-case basis. A *modification* is a change to the provisions of a lease stipulation, either temporarily or for the term of the lease. A *waiver* is a permanent exemption to a lease stipulation. Exceptions, modifications, and waivers apply to all types of stipulations, including NSO stipulations, and the authorized officer may only approve an exception, modification, or waiver "if the record shows that circumstances or relative resource values have changed or that the lessee can demonstrate that operations can be conducted without causing unacceptable impacts, and that less restrictive stipulations will protect the public interest" (U.S. Government, 1989).

Lands Closed to Leasing

BLM's Land Use Planning Handbook allows for consideration of closing areas to oil and gas leasing. These are areas where it has been determined that other land uses or resource values cannot be adequately protected with even the most restrictive lease stipulations; appropriate protection can be ensured only by closing the lands to leasing. Areas closed to leasing under each alternative are described in Sections 2.6 through 2.11 and shown on Figures 2-1 through 2-6 in Appendix A.

2.5.2 Proposed RMPA Alternatives

This section summarizes the six alternatives analyzed in detail in this RMPA/EIS. These alternatives present a range of reasonable management actions that were analyzed to assist decision-makers and the public in understanding the potential environmental consequences of each alternative.

The level of oil and gas development described in the RFD Scenario would apply to all six alternatives. Therefore, implementation of each alternative is assumed to result in no more than 37 new exploratory and development wells (32 development wells for Alternative B) on new or existing Federal oil and gas leases and up to 206 acres of associated disturbance from well pads, roads, and other facilities (e.g., gas plants, pipelines, and other infrastructure) during the 15- to 20-year period of analysis.

For each alternative, the BLM has identified specific lease stipulations that would protect important resource values for that alternative. Additionally, the BLM could apply mitigation measures to surface use activities associated with existing land use authorizations as a COA for an APD. BLM retains discretion to apply conditions to protect public land resources including the application of new lease stipulations resulting from the ROD and approved RMPA to other types of land uses and management actions (i.e., other than oil and gas leases) in order to maintain or achieve desired resource conditions.

Each alternative also considers closing different areas to oil and gas leasing. No alternative leaves all public land in the Planning Area open to oil and gas leasing. Public lands that are closed to leasing are subdivided into two groups. Tracts that have been closed by previous legislation, presidential proclamation, or secretarial policy (wilderness, wilderness study areas, and Fort Ord National Monument) form one group of lands and are known as non-discretionary closures. The second group of closed lands, consisting of Clear Creek Serpentine Area of Critical Environmental Concern and those proposed for closure under this plan, are discretionary closures.

Regardless of the alternative adopted in the approved ROD, existing lease stipulations attached to existing oil and gas leases, other than the 14 non-NSO leases subject to the settlement agreement, would continue to apply to those leases. New or additional lease stipulations would apply only to lands leased pursuant to the approved RMPA and ROD. Furthermore, environmental analyses would be conducted, as appropriate, for project- and site-specific actions proposed in the geographic area currently defined as the CCFO Planning Area. These site-specific evaluations would be facilitated by the planning and programmatic evaluation of impacts disclosed in the Final EIS supporting the ROD and approved RMPA. Finally, all areas currently closed to leasing under the 2007 HFO RMP would remain closed under all alternatives.

The components of each alternative are summarized in Table 2-1. Sections 2.6 through 2.11 describe each alternative, including the acreages that would be open or closed to oil and gas leasing and the stipulations applicable to management actions under that alternative. The goals, objectives, and management actions common to all alternatives are listed in Section 2.4 for energy and minerals. Figures 2-1 through 2-6 in Appendix A illustrate the major management elements of each alternative. Appendix C includes the text of all mitigation measures that would apply to the Proposed RMPA Alternatives.

Leases Subject to Settlement Agreement. As described in Chapter 1, this EIS analyzes the impacts to 14 non-NSO leases that were identified in Case No. 11-06174 (Hollister I) and Case No. 13-1749 (Hollister II) (*Center for Biological Diversity v. Bureau of Land Management*, 2014) under each of the RMPA alternatives. While BLM will select a Preferred Alternative as part of its plan-level decision for determining which BLM-managed lands or subsurface Federal minerals are open or closed to oil and gas leasing, the determination for the 14 leases will be an implementation-level decision. For each of the 14 leases, the implementation decision will be to decide whether to issue the lease based on whether the land is available or unavailable for leasing, and if available, the BLM will determine whether the current lease stipulations are sufficient or if additional stipulations are needed. This implementation decision will be in compliance with the approved RMPA and ROD. Table 2-2 presents an acreage summary of the 14 non-NSO leases by alternative. Table 2-3 presents which individual leases would be open with CSU, closed or open with NSO by alternative, and Table 2-4 includes the legal description for each Hollister I and II lease.

Table 2-1. Summary of Alternatives

Alternative	Areas Closed/Open to Oil & Gas Leasing	Stipulations*	Calculated GIS Acres Open with CSU	Calculated GIS Acres Closed	Calculated GIS Acres Open with NSO
A (No Action)	Areas currently open would remain open to oil and gas leasing; Areas closed under 2007 RMP would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, Ft. Ord National Monument).	Stipulations under the 2007 HFO RMP. NSO stipulations for: ▪ ACECs; and ▪ R&PP leases. Endangered Species stipulations for all open areas.	683,800	67,500	41,700
B	Lands within oil and gas fields and 0.5-mile buffer areas currently defined by DOGGR would be open; All other areas would be closed, including those closed in the 2007 RMP (Wilderness, WSAs, Clear Creek Serpentine ACEC, Ft. Ord National Monument).	CSU stipulations on lands open to leasing.	39,000	754,000	N/A
C	High oil and gas occurrence potential areas (with the exception of core population areas of the giant kangaroo rat (*Dipodomys ingens*) in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills) or lands within oil and gas fields and 0.5-mile buffer areas would be open; Moderate, low and no oil and gas occurrence potential areas would be closed; Areas closed under 2007 RMP would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, Ft. Ord National Monument).	CSU stipulations on lands open to leasing. NSO stipulations for: ▪ Critical habitat for Federally listed species; ▪ BLM developed recreation sites and administrative sites; and ▪ Special status split estate lands (state parks, county parks, conservation easements, land trusts, scenic designations).	368,800	394,400	29,800
D	Federal mineral estate underlying BLM surface estate would be open; Split estate lands would be closed; Ciervo-Panoche Natural Area would be closed; Areas closed under 2007 RMP would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, Ft. Ord National Monument).	CSU stipulations on lands open to leasing. NSO stipulations for: ▪ ACECs; and ▪ R&PP leases.	121,200	655,400	16,400

Table 2-1. Summary of Alternatives

Alternative	Areas Closed/Open to Oil & Gas Leasing	Stipulations*	Calculated GIS Acres Open with CSU	Calculated GIS Acres Closed	Calculated GIS Acres Open with NSO
E	Federal mineral estate outside of California DWR Bulletin 118 groundwater basins & sub-basins would be open; Federal mineral estate within California DWR Bulletin 118 groundwater basins & sub-basins would be closed; Areas closed under 2007 RMP would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, Ft. Ord National Monument).	CSU stipulations on lands open to leasing. NSO stipulations for: ▪ 12-digit Hydrologic Unit Codes intersecting EPA impaired, perennial surface waters; ▪ 12-digit Hydrologic Unit Codes intersecting non-impaired, perennial surface waters that intersect split estate; ▪ 12-digit Hydrologic Unit Codes subwatersheds with the highest aquatic intactness score ▪ 0.25 miles from non-impaired, perennial surface waters; and ▪ 0.25 miles from eligible Wild & Scenic Rivers.	487,200	99,400	206,400
F	Federal mineral estate would be open to leasing; Areas closed under 2007 RMP would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, Ft. Ord National Monument).	CSU stipulations on lands open to leasing. NSO stipulations for: ▪ Joaquin Rocks ACEC; ▪ ACECs within Ciervo-Panoche Natural Area; and ▪ Giant kangaroo rat core population areas.	683,100	67,500	42,400

* Standard lease terms apply to all areas open to leasing.

ACEC = Area of Critical Environmental Concern
NA = Not applicable
R&PP = Recreation & Public Purpose lease
T&E = Threatened & Endangered species
WSA = Wilderness Study Area

Table 2-2. Summary of Acreages of Leases Subject to Settlement by Alternative

Alternative	Calculated GIS Acres Open with CSU	Calculated GIS Acres Closed	Calculated GIS Acres Open with NSO
A (No Action)	17,600	N/A	N/A
B	3,800	13,800	N/A
C*	17,600	N/A	N/A
D	4,400	13,200	N/A
E	10,000	400	7,200
F	17,600	N/A	N/A

* Of the total lease area of approximately 17,600 acres, less than 0.5 percent would be closed or open with NSO, which is rounded to zero.

Table 2-3. Summary of Leases Subject to Settlement Agreement

	Alternative B			Alternative D			Alternative E		
Lease	Calculated GIS Acres Open with CSU	Calculated GIS Acres Closed	Calculated GIS Acres Open with NSO	Calculated GIS Acres Open with CSU	Calculated GIS Acres Closed	Calculated GIS Acres Open with NSO	Calculated GIS Acres Open with CSU	Calculated GIS Acres Closed	Calculated GIS Acres Open with NSO
Hollister I									
CACA 052959	—	110	—	80	30	—	—	—	110
CACA 052960	—	2,280	—	150	2,130	—	1,740	20	520
Hollister II									
CACA 053824	—	1,150	—	10	1,140	—	—	—	1,150
CACA 053825	—	2,150	—	130	2,020	—	70	—	2,080
CACA 053826	—	2,020	—	580	1,440	—	1,600	—	420
CACA 053827	—	270	—	—	270	—	—	—	270
CACA 053828	360	800	—	290	870	—	1,100	60	-
CACA 053829	860	N/A	—	860	—	—	580	—	280
CACA 053830	1,090	N/A	—	1,090	—	—	570	20	500
CACA 053831	1,100	810	—	550	1,360	—	1,610	240	60
CACA 053832	—	1,050	—	10	1,040	—	950	—	100
CACA 053833	380	70	—	220	230	—	130	—	320
CACA 053834	20	2,080	—	40	2,060	—	1,240	—	860
CACA 053835	—	1,000	—	390	610	—	450	40	510

Note: Alternatives A, C and F are not shown in Table 2-3, because areas subject to NSO or closed would be negligible, as shown in Table 2-2.

Table 2-4. Legal Description of Leases Subject to Settlement Agreement

Lease	Township/Range	Section	Subdivision
CACA 053824	T22S R9E	S6	S ½ of SW ¼
		S8	E ½ and SW ¼ of NW ¼
			W ½ and SE ¼ of NE ¼
			E ½ and SW ¼ of SW ¼
			N ½ and NE ¼ of SE ¼
		S15	SW ¼ of NW ¼
			SW ¼

Table 2-4. Legal Description of Leases Subject to Settlement Agreement

Lease	Township/Range	Section	Subdivision
		S18	NE ¼ of NE ¼
		S17	N ½ of NW ¼
			N ½ and SE ¼ of NE ¼
			N ½ of SE ¼
			N ½ and SE ¼ of SW ¼
CACA 053825	T22S R9E	S19	SW ¼ of SW ¼
		S20	S ½ of NE ¼
			N ½ and SE ¼ of SE ¼
		S21	E ½ of NE ¼
			SW ¼
			W ½ and SE ¼ of NW ¼
		S22	E ½ of NE ¼
			N ½ of NW ¼
			NE ¼ and SW ¼ of SW ¼
		S23	NW ¼
		S28	NE ¼
			SE ¼ of NW ¼
			NE ¼ of SE ¼
		S29	SW ¼ of SE ¼
			SE ¼ of NW ¼
			N ½ of SW ¼
		S30	NW ¼
			NW ¼ of NE ¼
			E ½ of SW ¼
		S31	E ½ of NE ¼
			W ½ of SE ¼
			N ½ of SW ¼
		S32	NE ¼
			E ½ of NW ¼
		S34	N ½ of SW ¼
CACA 053826	T23S R9E	S1	N ½
			SW ¼ of SW ¼
			SW ¼ of SE ¼
		S2	N ½
			E ½ of SE ¼
			SW ¼ of SW ¼
		S10	all
		S11	NW ¼ of NW ¼
			W ½ of SW ¼
			E ½ of SE ¼

Table 2-4. Legal Description of Leases Subject to Settlement Agreement

Lease	Township/Range	Section	Subdivision
		S12	NW ¾ of NW ¼
			SE ¼ of NE ¼
			E ½ of SE ¼
		S14	NW ¼ of NW ¼
CACA 053827	T23S R9E	S5	NE ¼
			E ½ of NE ¼
		S9	SW ¼ of SW ¼
CACA 053828	T16S R10E	S15	all
		S21	NW ¼ of NW ¼
			NW ¼ of SE ¼
		S22	N ½
			N ½ of S ½
CACA 053829	T16S R11E	S19	E ¾ of NE ¼
			E ½ of SE ¼
		S20	all
		S29	SE ¼ of NE ¼
CACA 053830	T16S R11E	S25	S ½
		S26	SE ¼
			S ½ of SW ¼
		S27	NE ¼ of NW ¼
		S34	NE ¼
			N ½ and SE ¼ of NW ¼
		S35	NW ¼
			N ½ of NE ¼
CACA 053831	T17S R11E	S7	W ½
			W ¼ of NE ¼
			W ½ of SE ¼
		S8	NW ¼
			SE ¼
		S9	NW ¼
		S17	W ½
			SE ¼
			W ½ and SE ¼ of NE ¼
CACA 053832	T17S R11E	S22	N ½
			SW ¼
			N ½ and SW ¼ of SE ¼
		S23	S ½ of NW ¼
			SE ¼ of NW ¼
		S24	S ½
			SE ¼ of NE ¼

Table 2-4. Legal Description of Leases Subject to Settlement Agreement

Lease	Township/Range	Section	Subdivision
CACA 053833	T16S R12E	S33	NE ¼
			S ½ of NW ¼
		S34	N ½
		S35	W ½ of SW ¼
CACA 053834	T17S R12E	S3	all
		S10	E ¾
		S15	all
		S22	NE ¼
			W ½ of NE ¼
			NW ¼ of SE ¼
CACA 053835	T17S R12E	S18	NE ¼ of NE ¼
			NW ¼ of SE ¼
		S19	all
		S20	SW ¼
			SW ¼ of SE ¼
		S21	SW ¼ of NW ¼
CACA 052959	T22S R8E	S1	NW ¼ of NW ¼
			S ½ of SW ¼
CACA 052960	T24S R10E	S5	NW ¼ of NW ¼
			W ½ and SE ¼ of SW ¼
		S6	W ½
			SE ¼
			S ½ of NE ¼
		S7	NE ¼
			E ½ of SE ¼
			SW ¼ of NW ¼
			NW ¼ of SW ¼
		S8	W ½
			SE ¼
		S9	SW ¼
			W ½ of SE ¼
		S17	N ½
			SE ¼
			N ½ and SE ¼ of SW ¼

2.5.3 Management Actions

As discussed in Section 2.4, BLM would implement management actions established in the 2007 RMP, as well as new management actions. Table 2-5 summarizes how the 2007 RMP and new management actions would be implemented by the various Proposed RMPA alternatives. The text of management actions

common to all alternative is included in Section 2.4. Management actions applicable to each individual alternative are included in Sections 2.6 through 2.11.

Table 2-5. Management Actions in Proposed RMPA Alternatives

Management Action and Topic	Alternative A (No Action)	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Management Actions from 2007 RMP						
ENERG-COM1. Close WSAs and Wilderness Areas	X	X	X	X	X	X
ENERG-COM3. NSO on R&PP lease areas	X			X		
ENERG-COM4. Availability of public lands for energy and mineral development	X	X	X	X	X	X
ENERG-COM5. Environmental and multiple-use management constraints	X	X	X	X	X	X
ENERG-C1. NSO in special status species habitat in ACECs	X			X		
ENERG-C4. Stipulations and mitigation for special status species	X	X	X	X	X	X
New Management Actions						
ENERG-A1. Closure of Fort Ord	X	X	X	X	X	X
ENERG-A2. Closure of lands outside of DOGGR fields and buffer areas		X				
ENERG-A3. CSU stipulations on open lands		X	X	X	X	X
ENERG-A4. Closure of moderate, low, and no occurrence potential			X			
ENERG-A5. NSO to protect habitat and recreation			X			
ENERG-A6. Closure of giant kangaroo rat core population areas						
ENERG-A7. Closure of split estate				X		
ENERG-A8. Closure to protect groundwater basins					X	
ENERG-A9. NSO to protect surface waters					X	
ENERG-A10. NSO to protect giant kangaroo rat core population areas and specified ACECs						X

2.6 Alternative A (No Action Alternative)

2.6.1 Description of Alternative A

Alternative A (Figure 2-1 in Appendix A) would utilize the 2015 RFD Scenario and would continue current management under the existing 2007 HFO RMP (BLM, 2007). The updated RFD Scenario would be utilized so that this No Action alternative would remain the baseline for comparison of impacts for the five action alternatives which also use the 2015 RFD Scenario. All Federal mineral estate would be available

for oil and gas leasing, except for designated wilderness, wilderness study areas (WSAs), Fort Ord National Monument, and Clear Creek Serpentine Area of Critical Environmental Concern (ACEC), which are closed under the 2007 Hollister Field Office RMP.

NSO stipulations would be applied in ACECs and Recreation and Public Purpose (R&PP) leases. The Endangered Species stipulation from the 2007 Hollister Field Office RMP would apply in all areas open to leasing (see Appendix D in BLM, 2007).

Under Alternative A, approximately 683,800 acres of BLM oil and gas Federal mineral estate are identified as open to oil and gas leasing with CSU stipulation(s), 67,500 acres would be closed to oil and gas leasing, and 41,700 acres would be subject to NSO lease stipulations (see Appendix D of BLM, 2007).

The No Action Alternative would continue the current management goals, objectives, and direction as specified in the 2007 Hollister Field Office RMP. In addition to the goals, objectives, and management actions common to all alternatives (see Section 2.4), BLM established the following management actions in the 2007 RMP that would apply to Alternative A:

- **ENERG-COM3.** Require No Surface Occupancy stipulations on all Recreation and Public Purposes lease areas. [*applies to Alternatives A and D only*]
- **ENERG-C1.** Oil and gas leases in ACECs would stipulate No Surface Occupancy in special status species habitat (BLM, 2007; Appendix D) [*applies to Alternatives A and D only*]

2.6.2 Leases Subject to Settlement Agreement under Alternative A – Subalternative 1

Under Alternative A, the BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and II, would be open to leasing. The leases total approximately 17,600 acres. Under Subalternative 1, the implementation decision would be to issue all 14 non-NSO leases. The Endangered Species stipulation from the 2007 Hollister Field Office RMP would apply in all areas of the leases.

The 14 non-NSO leases are located in San Benito and Monterey Counties. In San Benito County, eight non-NSO leases are in a mountainous area that is less than 0.5 miles north of the San Benito Mountain Research Natural Area and approximately 4 miles south of the Panoche Hills South Wilderness Study Area. These leases are within the active Vallecitos oil and gas field or within approximately 7 miles of the field boundary, as shown in Figure 2-1 (detailed view).

In Monterey County, six non-NSO leases are located across two mountainous areas with the first area approximately 4 miles west of the community of San Ardo and 4 miles north of Lake San Antonio, and the second area approximately 9 miles south of San Ardo and 1.5 miles east of Lake San Antonio. The Monterey County leases are within approximately 10 miles of the active San Ardo oil and gas field, which is generally located east of the non-NSO leases in Monterey County.

2.6.3 Leases Subject to Settlement Agreement under Alternative A – Subalternative 2

Under Subalternative 2, the management decisions for Alternative A would still apply, and the BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and II, would be open to leasing. However, for analysis purposes, the implementation decision would be: (1) that the two non-NSO leases as identified in Hollister I should not have been issued; and (2) to not issue the 12 prospective non-NSO leases as identified in Hollister II.

2.7 Alternative B

2.7.1 Description of Alternative B

Under Alternative B (Figure 2-2 in Appendix A), Federal mineral estate within the boundaries of oil and gas fields plus a 0.5-mile buffer defined by DOGGR[5] would be open to oil and gas leasing. Other areas would be closed to oil and gas leasing.

Controlled Surface Use (CSU) stipulations would apply to all lands open to leasing (see Appendix C). Under Alternative B, approximately 39,000 acres of BLM oil and gas Federal mineral estate are identified as open to oil and gas leasing with CSU stipulation(s) and 754,000 acres would be closed to leasing.

In addition to the goals, objectives, and management actions common to all alternatives (see Section 2.4), BLM established the following new management actions under Alternative B:

- **ENERG-A2.** Public lands within oil and gas fields plus a 0.5-mile buffer defined by DOGGR would be open to oil and gas leasing; all other public lands would be closed to leasing. [*applies to Alternative B only*]
- **ENERG-A3.** Require CSU stipulations on all public lands open to oil and gas leasing. (See Appendix C.) [*applies to Alternatives B, C, D, E and F only]*

2.7.2 Leases Subject to Settlement Agreement under Alternative B

Under Alternative B, of the BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and II, approximately 3,800 acres would be open with CSU stipulations and 13,800 acres would be closed. Therefore, the implementation decision would be to issue leases only for the 3,800 acres that are open to leasing under this alternative. These leases would be subject to CSU stipulations. Table 2-3 indicates which of the individual leases would be open with CSU stipulations or closed under Alternative B.

Under Alternative B, almost 80 percent of the 14 non-NSO lease acreages would be closed to leasing. Unlike Alternative A, Alternative B would change the current management goals, objectives, and direction of the lease areas from what was specified in the 2007 HFO RMP.

2.8 Alternative C

2.8.1 Description of Alternative C

Under Alternative C (Figure 2-3 in Appendix A), unless currently closed under the 2007 Hollister Field Office RMP, Federal mineral estate would be open to leasing within high oil and gas occurrence potential areas or within the boundaries of oil and gas fields plus a 0.5-mile buffer currently identified by DOGGR, with the exception of core population areas of the giant kangaroo rat in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills, which are closed to leasing.

CSU stipulations would apply to all lands open to leasing (see Appendix C). NSO stipulations would apply to some lands open to leasing, including: (1) critical habitat for Federally listed species; (2) BLM developed recreation and administrative sites; and (3) special status split estate lands (e.g., state parks, county parks, conservation easements, land trusts, and scenic designations).

[5] In the Environmental Impact Report prepared by DOGGR under Senate Bill 4, each oil and gas field includes a buffer area around it within which future activities may occur. DOGGR's buffer was developed to factor in potential development or new finds that could be brought into production for the EIR impact analysis based on industry production estimates. It is not used for DOGGR's oilfield management. Within the CCFO Planning Area, the buffer is 0.5 miles around existing fields. (DOC, 2015 page 5-1)

Under Alternative C, approximately 368,800 acres of BLM oil and gas Federal mineral estate are identified as open to oil and gas leasing with CSU stipulation(s), 394,400 acres would be closed to leasing, and 29,800 acres would be subject to NSO stipulations. Of the approximately 394,400 acres closed to leasing, approximately 35,400 acres are located within or in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills. The areas that are proposed for closure to leasing within Panoche, Griswold, Tumey, and Ciervo Hills areas have been prioritized by US Fish and Wildlife Service for the protection and recovery of a core population of the federally endangered giant kangaroo rat (*Dipodomys ingens*), as well as for protection and recovery of the federally endangered San Joaquin kit fox (*Vulpes macrotis mutica*) in the Recovery Plan for the Upland Species of the San Joaquin Valley (2008). These lands are part of the Ciervo-Panoche Natural Area and they are known to contain dense populations of these listed species. The proposed closure of Federal minerals in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills is intended to maintain connectivity and movement corridors within suitable habitat for the giant kangaroo rat and San Joaquin kit fox. Additionally, portions of these areas are known to contain the federally endangered blunt-nosed leopard lizard (*Gambelia silus*).

While the NSO stipulation does not apply as a blanket protection for ACECs under Alternative C, protections would still be provided for the ACECs' biological resources. BLM policy is to apply the least restrictive stipulation necessary to adequately protect the identified resource value(s), thus CSU stipulations are being considered in addition to closures and NSO stipulations within the range of alternatives. Under Alternative C, approximately half of the Panoche-Coalinga ACEC, the core population areas of the giant kangaroo rat, would be closed to leasing. NSO stipulations would apply to threatened and endangered species critical habitat, and CSU stipulations would apply to the remainder of the ACEC acres left open to leasing. The CSU-Protected Species stipulation provides that presence of habitat or species may result in the proposed action being moved, modified, or delayed to mitigate project effects.

In addition to the goals, objectives, and management actions common to all alternatives (see Section 2.4), BLM established the following new management actions that would apply to Alternative C:

- **ENERG-A3.** Require CSU stipulations on all public lands open to oil and gas leasing. (See Appendix C.) [*applies to Alternatives B, C, D, E and F only*]
- **ENERG-A4.** Public lands within areas of high oil and gas potential or public lands within oil and gas fields plus a 0.5-mile buffer defined by DOGGR would be open to oil and gas leasing, with the exception of core population areas of the giant kangaroo rat in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills, which are closed to leasing. Public lands within areas of moderate, low, and no potential would be closed to mineral leasing. [*applies to Alternative C only*]
- **ENERG-A5.** Require NSO stipulations for public lands open to oil and gas leasing which include: (1) critical habitat for Federally listed species; (2) BLM developed recreation and administrative sites; and (3) special status split estate lands (e.g., state parks, county parks, conservation easements, land trusts, and scenic designations). [*applies to Alternative C only*]

2.8.2 Leases Subject to Settlement Agreement under Alternative C

Under Alternative C, approximately 17,600 acres of the BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and II, would be open to oil and gas leasing with CSU stipulations. Therefore, the implementation decision would be to issue all 14 non-NSO leases with CSU stipulations. Alternative C would not change the current management goals, objectives, and direction of the 14 leases, and no NSO stipulations would apply to the lease areas.

2.9 Alternative D

2.9.1 Description of Alternative D

Under Alternative D (Figure 2-4 in Appendix A), unless currently closed under the 2007 Hollister Field Office RMP, Federal mineral estate underlying BLM surface estate would be open to oil and gas leasing. All BLM split estate lands and the Ciervo-Panoche Natural Area (both BLM surface and split estate lands) would be closed to leasing.

CSU stipulations would apply to all lands open to leasing (see Appendix C). NSO stipulations would be applied in ACECs and R&PP leases.

Under Alternative D, approximately 121,200 acres of BLM oil and gas Federal mineral estate are identified as open to oil and gas leasing with CSU stipulation(s), 655,400 acres would be closed to leasing, and 16,400 acres would be subject to NSO stipulations.

In addition to the goals, objectives, and management actions common to all alternatives (see Section 2.4), BLM established the following management actions in the 2007 RMP that would apply to Alternative D:

- **ENERG-COM3.** Require No Surface Occupancy stipulations on all Recreation and Public Purposes lease areas. [*applies to Alternatives A and D only*]
- **ENERG-C1.** Oil and gas leases in ACECs would stipulate No Surface Occupancy in special status species habitat (BLM, 2007; Appendix D) [*applies to Alternatives A and D only*]

The following new management actions would also be established in addition to those established in the 2007 RMP for Alternative D:

- **ENERG-A3.** Require CSU stipulations on all public lands open to oil and gas leasing. (See Appendix C.) [*applies to Alternatives B, C, D, E and F only*]
- **ENERG-A7.** Federal mineral estate underlying BLM surface estate would be open to oil and gas leasing. Split estate public lands would be closed to oil and gas leasing. [*applies to Alternative D only*]

2.9.2 Leases Subject to Settlement Agreement under Alternative D

Under Alternative D, of the BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and II, approximately 13,200 acres would be closed and 4,400 acres would be open with CSU stipulations. Therefore, the implementation decision would be to issue leases only for the 4,400 acres that are open to leasing under this alternative. These leases would be subject to CSU stipulations. Table 2-3 indicates which of the individual leases would be open with CSU stipulations or closed under Alternative D.

Under Alternative D, approximately 75 percent of the 14 non-NSO lease acreages would be closed to leasing. Unlike Alternative A, Alternative D would change the current management goals, objectives, and direction of the lease areas from what was specified in the 2007 HFO RMP.

2.10 Alternative E

2.10.1 Description of Alternative E

Under Alternative E (Figure 2-5 in Appendix A), unless currently closed under the 2007 Hollister Field Office RMP, Federal mineral estate outside of a California Department of Water Resources (DWR) Bulletin 118, Groundwater Basin or Sub-basin, would be open to oil and gas leasing.

CSU stipulations would apply to all lands open to leasing (see Appendix C). NSO stipulations would apply to some lands open to leasing, including: (1) 12-digit Hydrologic Unit Codes (HUCs) intersecting EPA impaired, perennial surface waters (BLM surface and split estate); (2) 12-digit HUCs intersecting non-

impaired, perennial surface waters that intersect split estate; (3) 12-digit HUC subwatersheds with the highest aquatic intactness score; (4) 0.25 miles from non-impaired, perennial surface waters; and (5) 0.25 miles from eligible Wild and Scenic Rivers.

Under Alternative E, approximately 487,200 acres of BLM oil and gas Federal mineral estate are identified as open to oil and gas leasing with CSU stipulation(s), 99,400 acres would be closed to leasing, and 206,400 acres would be subject to NSO stipulations.

In addition to the goals, objectives, and management actions common to all alternatives (see Section 2.4), BLM established the following new management actions that would apply to Alternative E:

- **ENERG-A3.** Require CSU stipulations on all public lands open to oil and gas leasing. (See Appendix C.) [*applies to Alternatives B, C, D, E and F only*]
- **ENERG-A8.** Public lands outside of California DWR Bulletin 118 groundwater basins and sub-basins would be open to oil and gas leasing. Public lands within California DWR Bulletin 118 groundwater basins and sub-basins would be closed to mineral leasing. [*applies to Alternative E only*]
- **ENERG-A9.** Require NSO stipulations for public lands open to leasing which include: (1) 12-digit Hydrologic Unit Codes (HUCs) intersecting EPA impaired, perennial surface waters (BLM surface and split estate); (2) 12-digit HUCs intersecting non-impaired, perennial surface waters that intersect split estate; (3) 0.25 miles from non-impaired, perennial surface waters; and (4) 0.25 miles from eligible Wild and Scenic Rivers; and (5) 12-digit HUC subwatersheds with the highest aquatic intactness score. [*applies to Alternative E only*]

2.10.2 Leases Subject to Settlement Agreement under Alternative E

Under Alternative E, of the BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and II, approximately 10,000 acres would be open with CSU stipulations, 7,200 acres would be open with NSO, and 400 acres would be closed. Under Alternative E, approximately 57 percent of the 14 non-NSO lease acreages would be open to leasing with CSU stipulations, 41 percent would be open in areas subject to NSO stipulations, and 2 percent would be closed to leasing. Table 2-3 indicates which of the individual leases would be open with CSU stipulations, open with NSO, or closed under Alternative E.

Therefore, the implementation decision would be to issue leases for 10,000 acres with CSU stipulations, issue NSO leases for 7,200 acres with NSO stipulations. The remaining 400 acres would not be leased. Unlike Alternative A, Alternative E would incorporate new restrictions in the current management goals, objectives, and direction of the lease areas from what was specified in the 2007 HFO RMP.

2.11 Alternative F

2.11.1 Description of Alternative F

Under Alternative F (Figure 2-6 in Appendix A), unless currently closed under the 2007 Hollister Field Office RMP, Federal mineral estate would be open to oil and gas leasing with CSU stipulations and/or subject to NSO.

CSU stipulations would apply to all lands open to leasing (see Appendix C). NSO stipulations would apply to some lands open to leasing, including: (1) Joaquin Rocks ACEC; (2) ACECs within Ciervo-Panoche Natural Area; and (3) giant kangaroo rat core population areas. Under Alternative F, approximately 683,100 acres of BLM oil and gas Federal mineral estate are identified as open to oil and gas leasing with CSU stipulation(s), 67,500 acres would be closed to leasing, and 42,400 acres would be subject to NSO stipulations.

Under Alternative F, the NSO stipulation does not apply to all ACECs. However, protections would be provided for the Joaquin Rocks ACEC and ACECs within the Ciervo-Panoche Natural Area. BLM policy is to apply the least restrictive stipulation necessary to adequately protect the identified resource value(s), thus CSU stipulations are being considered in addition to closures and NSO stipulations within the range of alternatives. As with all alternatives, the CSU-Protected Species stipulation provides that presence of habitat or species may result in the proposed action being moved, modified, or delayed to mitigate project effects.

In addition to the goals, objectives, and management actions common to all alternatives (see Section 2.4), BLM established the following new management actions that would apply to Alternative F:

- **ENERG-A3.** Require CSU stipulations on all public lands open to oil and gas leasing. (See Appendix C.) [*applies to Alternatives B, C, D, E and F only*]
- **ENERG-A10.** Require NSO stipulations for public lands open to oil and gas leasing which include: (1) Joaquin Rocks ACEC; (2) ACECs within Ciervo-Panoche Natural Area; and (3) Giant kangaroo rat core population area. [*applies to Alternative F only*]

2.11.2 Leases Subject to Settlement Agreement under Alternative F

Under Alternative F, approximately 17,600 acres of the BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and II, would be open to leasing with CSU stipulations. Therefore, the implementation decision would be to issue all 14 non-NSO leases with CSU stipulations. Alternative F would not change the current management goals, objectives, and direction of the 14 leases, and no NSO stipulations would apply to the lease areas.

2.12 Comparison of Alternatives

A detailed comparison of alternatives is presented in Table 2-6. Not all resources or resource uses presented in Chapter 3 (Affected Environment) or Chapter 4 (Environmental Consequences) of this Proposed RMPA/Final EIS are included in Table 2-6. Omission of some resources is because revision of some decisions and management actions included in the 2007 Hollister Field Office RMP do not relate to an increase in oil and gas exploration, development, and production, or the potential effects of that increase on other resources or resource uses, and, thus, are beyond the scope of this RMPA/EIS. Additionally, because of the distribution of some resources, the effects of the decisions and management actions relating to oil and gas would be the same or similar under all alternatives. Table 2-1 in Section 2.5.2 provides a comparison of acreages affected by allowable uses and management actions for each alternative. The environmental consequences of allowable uses and management actions proposed under each alternative are analyzed in Chapter 4.

2.13 Alternatives Considered but Not Analyzed in Detail

The following alternatives were considered as possible management approaches but were eliminated from detailed analysis because the BLM determined that they either did not meet the purpose and need for the RMPA/EIS (see Section 1.1), were covered under alternatives analyzed in the RMPA/EIS, or were not practical or feasible alternatives due to technical, economic, and legal and policy considerations. These alternatives include:

- Close Special Surface Status Split Estate Lands
- No Action Alternative without NSO Stipulations
- Ban Well Stimulation Technologies
- Close All Lands Except Existing Leases
- Close All Lands to Oil and Gas Leasing

The specific rationale for dismissing each alternative from further consideration is described below.

Table 2-6. Comparison of Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Energy and Minerals	Provides most flexibility for oil and gas drilling	Provides least flexibility for oil and gas drilling	Provides more flexibility for oil and gas drilling than Alternatives B and D	Provides more flexibility for oil and gas drilling than Alternative B	Provides more flexibility for oil and gas drilling than Alternatives B, C, and D	Provides more flexibility for oil and gas drilling than Alternatives B, C, D and E. Similar closure acreage to Alternative A, but slightly greater acreage of NSO stipulations
Hazardous Materials and Public Safety	Does not confine impacts to the public due to upset conditions[1] Emergency response times could be longest	Confines impacts to the public due to upset conditions[1] to areas of existing oil and gas production and active fields Emergency response times would likely be shortest	Does not confine impacts to the public due to upset conditions[1] Emergency response times could be fourth longest	Confines impacts to the public due to upset conditions[1] to BLM surface estate Emergency response times could be second shortest	Confines impacts to the public due to upset conditions[1] to outside groundwater basins Emergency response times could be third longest	Does not confine impacts to the public due to upset conditions[1] Emergency response times could be second longest
Air Quality and Atmospheric Conditions	Greatest potential for causing localized air quality impacts to sensitive receptors	Limited potential for causing localized air quality impacts to sensitive receptors	Potential for causing localized air quality impacts to sensitive receptors but minimized with CSU/Management stipulations	Limited potential for causing localized air quality impacts to sensitive receptors but minimized with CSU/Management stipulations	Potential for causing localized air quality impacts to sensitive receptors but minimized with CSU/Management stipulations	Second greatest potential for causing localized air quality impacts to sensitive receptors but minimized with CSU/Management stipulations
Groundwater Resources	Could impact 4 groundwater basins assiged a high priority ranking	Could impact 1 groundwater basin assigned a high priority ranking	Could impact 3 groundwater basins assigned a high priority ranking	Could impact 3 groundwater basins assigned a high priority ranking	Would not impact groundwater basins assigned a high priority ranking Most protective for groundwater resources	Could impact 4 groundwater basins assigned a high priority ranking
Surface Water Resources	Could impact largest number of watersheds	With Alternative E, would impact fewest number of watersheds	With Alternative D, Alternative C would impact fewer watersheds than Alternatives A and F, but more than Alternatives B and E	With Alternative C, Alternative D would impact fewer watersheds than Alternatives A and F, but more than Alternatives B and E	With Alternative B, would impact fewest number of watersheds	Could impact largest number of watersheds, similar to Alternative A

Table 2-6. Comparison of Alternatives

Resource	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Biological Resources	Least protective of biological resources	With Alternative E, more protective of biological resources than Alternative A and F, but less protective than Alternatives C and D	Most protective of T&E species habitat	Most protective of the Ciervo-Panoche Natural Area and the special status species found in that area	With Alternative B, more protective of biological resources than Alternative A but less protective than Alternatives C, D, and F	Similar to Alternative A, but slightly more protective due to NSO stipulation to protect special status species
Visual Resources	Potential to be inconsistent with VRM Class II and Class III objectives	Potential to be inconsistent with VRM Class III objectives	Potential to be inconsistent with VRM Class II and Class III objectives	Potential to be inconsistent with VRM Class II and Class III objectives	Potential to be inconsistent with VRM Class I, Class II, and Class III objectives	Potential to be inconsistent with VRM Class II and Class III objectives
Special Management Areas	Less adverse effects than Alternatives C, and E, more adverse effects than B and D	Least adverse effects	Greatest adverse effects, similar potential as Alternative F	Less adverse effects than Alternatives A, C, and E, more adverse effects than Alternative B	Less adverse effects than Alternative C, more adverse effects than Alternatives A, B, and D	Less adverse effects than Alternatives C, and E, more adverse effects than B and D, slightly more adverse effects than Alternative A.
Social and Economic Conditions	Adverse effects from split estate would be similar to Alternatives C, E, and F	Less adverse effects from split estate lands than Alternatives A, C, E, and F	Adverse effects from split estate would be similar to Alternatives A, E, and F	No potential adverse effects from split estate lands	Adverse effects from split estate would be similar to Alternatives A, C, and F	Adverse effects from split estate lands would be similar to Alternatives A, C and E
Lands and Realty	Greatest flexibility for BLM's options for locating ground disturbing activities	Most restrictive of BLM's options for locating ground disturbing activities	Greater flexibility for BLM's options for locating ground disturbing activities than Alternatives B and D	Greater flexibility for BLM's options for locating ground disturbing activities than Alternative B	Greater flexibility for BLM's options for locating ground disturbing activities than Alternatives B, C, and D	Second greatest flexibility for BLM's options for locating ground disturbing activities
Wild and Scenic Rivers	Greatest potential for impacts to National Wild and Scenic Rivers	Negligible impact to National Wild and Scenic Rivers	Greater potential for impacts to National Wild and Scenic Rivers than Alternative B, similar potential as Alternative E and less than Alternatives A, D and F	Greater potential for impacts to National Wild and Scenic Rivers than Alternatives B, C, and E, slightly less severe than Alternatives A and F	Greater potential for impacts to National Wild and Scenic Rivers than Alternative B, similar potential as Alternative C and less than potential than Alternatives A, D and F	Greater potential for impacts to National Wild and Scenic Rivers than Alternatives B, C, D and E, slightly less potential for impacts as Alternatives A

[1] Upset conditions are defined as any sudden and unavoidable malfunction and/or failure of equipment, or unintended failure to operate in a normal or usual manner.

2.13.1 Close Special Surface Status Split Estate Lands

The BLM considered an alternative that would close special surface status split estate lands (e.g., state parks, county parks, conservation easements, land trusts, scenic designations) to oil and gas leasing and development. Other split estate lands would be open to oil and gas leasing and development. BLM eliminated this alternative from further consideration, because closure of all split estate lands under Alternative D would include closure of special surface status split estate lands. Therefore, closure of lands under this alternative is already addressed in this RMPA/EIS under Alternative D and no separate analysis is necessary.

2.13.2 No Action Alternative without NSO Stipulations

The BLM considered an alternative that would close the same lands as would be closed under the No Action Alternative (Alternative A). However, NSO stipulations for ACECs and R&PP leases would be removed. BLM eliminated this alternative from further consideration because such an alternative would be too similar to the No Action Alternative and thus has already been covered in the range of alternatives evaluated in this RMPA/EIS.

2.13.3 Ban Well Stimulation Technologies

BLM has statutory authority for regulation of all oil and gas operations on Federal mineral estate under the Mineral Leasing Act of 1920, the Federal Land Policy and Management Act (FLPMA) of 1976, and the Federal Oil and Gas Royalty Management Act of 1982, among others. Regulatory authority to implement these statutes is codified in Title 43 of the Code of Federal Regulations. Under Federal regulations the BLM, as the Federal minerals and/or surface owner, is responsible for regulating oilfield operations (subsurface and surface resources) on all Federal mineral estate.

The BLM considered an alternative that would ban the use of well stimulation technologies on Federal mineral estate. This alternative was eliminated from further consideration because while BLM has the authority to deny individual permits, it does not have authority to deny all future well stimulation technologies. Rather BLM has a responsibility under the FLPMA to act as a steward for the development, conservation, and protection of Federal lands, by implementing multiple use principles and recognizing, among other values, the Nation's need for domestic sources of minerals from the public lands. A ban or moratorium would not satisfy the BLM's multiple-use responsibilities under the FLPMA.

Additionally, the BLM Land Use Planning Handbook H-1601-1 states that, for oil and gas decisions, "[w]hen applying leasing restrictions, the least restrictive constraint to meet the resource protection objective should be used" (BLM, 2005, Appendix C, pg. 24). An alternative banning well stimulation technologies in the Plan Area would be inconsistent with the basic policy objectives for management of oil and gas resources in BLM.

2.13.4 Close All Lands Except Existing Leases

The BLM considered an alternative where all lands would be closed to oil and gas leasing and development except for existing leases. As discussed in Section 2.13.3, the FLPMA of 1976 establishes the authority and provides guidance for how public lands are to be managed by the BLM. Furthermore, it defines BLM's mission to manage public lands on the basis of multiple use and sustained yield. Energy development is one of those uses.

Likewise, the Mining and Minerals Policy Act of 1970 (30 U.S.C. § 21 et seq.) declares that "it is the continuing policy of the Federal Government in the national interest to foster and encourage private enterprise in (1) the development of economically sound and stable domestic mining [and] minerals... (2) the orderly and economic development of domestic mineral resources [and] reserves.... For the purposes of this section 'minerals' shall include all minerals and minerals fuels including oil [and] gas."

In addition, BLM's Land Use Planning Handbook 1601-1 indicates that lands should not be closed to leasing unless it is determined that other land uses or resources cannot be adequately protected with even

the most restrictive lease stipulations. Finally, BLM Manual 3120 states "It is the Bureau of Land Management's (BLM) policy to encourage the orderly development of Federal onshore oil and gas resources by offering lands for oil and gas leasing by competitive oral bidding when eligible lands are available."

The alternatives brought forward in this RMPA/EIS represent the areas within the CCFO Planning Area that the BLM needs to consider closing to protect sensitive resources, but it is not necessary to close all lands to leasing except existing leases. Furthermore, this alternative would be contrary to BLM's mission and policies, which dictate management of public lands for multiple-uses and encourage energy development. Therefore, an alternative that would close all lands to oil and gas leasing except existing leases has been eliminated from further consideration in this RMPA/EIS.

2.13.5 Close All Lands to Oil and Gas Leasing

The BLM considered an alternative that would close all Federal mineral estate to oil and gas leasing and development. For the same reasons discussed in Section 2.13.4, this alternative would be contrary to BLM's mission and policies, which dictate management of public lands for multiple-uses and encourage energy development. Therefore, an alternative that would close all lands to oil and gas leasing has been eliminated from further consideration in this RMPA/EIS.

3. Affected Environment

3.1 Introduction

This chapter describes existing conditions for Bureau of Land Management (BLM) resource programs, resource uses, special designations, and the social and economic environment in the Central Coast Field Office (CCFO) Planning Area. The description of the affected environment uses the best and most recent data available.

In addition to describing existing conditions, where appropriate, this chapter identifies management challenges for oil and gas development within the Planning Area. The BLM reviewed current management and reviewed the scoping comments to amend the 2007 RMP for the Southern Diablo Mountain Range and Central Coast of California. By describing existing conditions for resource programs in the Planning Area, this chapter serves as the baseline against which Chapter 4 analyzes potential impacts of the alternatives.

The CCFO Planning Area encompasses about 6.8 million acres of land throughout San Francisco, Contra Costa, San Mateo, Alameda, San Joaquin, Santa Cruz, Santa Clara, Stanislaus, Monterey, San Benito, Merced, and Fresno Counties. Most of the acres are in private, State, or local ownership. Bounded by the Pacific Ocean to the west and the San Joaquin Valley to the east, elevations range from sea level to over 5,000 feet. This is a region of diverse landscapes and extraordinary biodiversity. Major landforms include the Diablo Mountain Range, Salinas Valley, and San Joaquin Valley. Public lands are distributed across the Planning Area in numerous small parcels. The BLM CCFO is directly responsible for the management of approximately 284,000 acres of public land (less than 1% of the total) and 793,000 acres of Federal mineral estate (approximately 1.2% of the total).

3.1.1 Resources Not Considered

This chapter does not provide detail about environmental components that would not be affected or that are not essential to understanding or resolving planning issues. These include the following resources:

Back Country Byways. There are no designated Back Country Byways in the Planning Area.

Cave and Karst Resources. No areas of karst formation or caves are known to occur within the Planning Area.

Fire Management. No additional effects to Fire Management would result from the Oil and Gas Management not already addressed in the 2007 HFO RMP[1] (BLM, 2006). The risk of fire is addressed in Hazardous Materials and Public Safety.

Forest and Woodland Products. Forest and woodland management produces traditional market products such as lumber, plywood, and paper as well as other uses such as poles, greenery, biomass for energy production, and fuelwood for personal use while concurrently maintaining high-quality wildlife habitat. There are no forests managed for forest products on BLM lands in the Planning Area.

Livestock Grazing. The BLM CCFO administers 71 active commercial grazing leases for both sheep and cattle. Forage generally consists of annual grasses and forbs which grow during these wetter months. Rangelands are managed to ensure that enough residual mulch remains after each grazing season. No

[1] See Proposed RMP/Final EIS for the Southern Diablo Mountain Range and Central Coast of California Section 3.7 (Fire Management) for the affected environment and 4.7 (Fire Management) for the effects analysis. See Resource Management Plan for the Southern Diablo Mountain Range and Central Coast of California Record of Decision Section 3.7 (Fire Management) for the Resource Management Plan.

additional effects to Livestock Grazing would result of the Oil and Gas Management not already addressed in the 2007 HFO RMP,[2] the management of livestock would remain the same.

Recreation. The diverse landscapes of the CCFO Planning Area provide for a variety of recreational opportunities, including: hiking, mountain biking, and equestrian trails, hunting, and camping. There would be no additional effects to Recreation as a result of the Oil and Gas Management not already addressed in the 2007 HFO RMP.[3]

Wild Horses and Burros. There are no Wild Horses and Burros Management Areas in the CCFO Planning Area.

[2] See Proposed RMP/Final EIS for the Southern Diablo Mountain Range and Central Coast of California Section 3.11 (Livestock Grazing) for the affected environment and 4.11 (Livestock Grazing) for the effects analysis. See Resource Management Plan for the Southern Diablo Mountain Range and Central Coast of California Record of Decision Section 3.11 (Livestock Grazing) for the Resource Management Plan.

[3] See Proposed RMP/Final EIS for the Southern Diablo Mountain Range and Central Coast of California Section 3.8 (Recreation) for the affected environment and 4.8 (Recreation) for the effects analysis. See Resource Management Plan for the Southern Diablo Mountain Range and Central Coast of California Record of Decision Section 3.8 (Recreation) for the Resource Management Plan.

3.2 Energy and Minerals

This section addresses exploration, development, and production of energy and mineral resources. Considering that the RFD Scenario addresses the possibility of drilling up to 37 new exploration and development oil and gas wells, the principal issue for this resource [energy and mineral resources] is the potential interference of those operations [energy and mineral resources] with new or expanded mineral development.

3.2.1 Introduction

BLM supports an "all of the above" energy approach, which includes oil and gas, coal, strategic minerals, and renewable energy resources such as wind, geothermal and solar. BLM's energy and minerals program in the CCFO Planning Area includes activities related to fluid minerals, solid minerals, salable minerals (e.g., sand, gravel, limestone and building rocks), and leasable minerals (e.g., oil and gas leases), in addition to wind energy land use authorizations.

Historically, the levels of both energy and mineral development have been low on public lands in the CCFO Planning Area (BLM, 2006). There is little active mining on or immediately adjacent to BLM-administered land in the CCFO Planning Area. Some mining for building stone, sand and gravel, shale, and limestone has occurred in the past at the Clear Creek Management Area, Williams Hill, and near the Griswold Hills in the Vallecitos Valley.

3.2.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/EIS) refer to Appendix J.

3.2.3 Regional Setting

Oil and Gas

The history of activity for oil and gas exploration and development on Federal mineral estate within the planning area is extremely low compared to private lands. The Reasonable Foreseeable Development Scenario (Appendix B) provides a detailed discussion of the regional setting for oil and gas in the CCFO Planning Area on Federal and private lands. The BLM oversees 793,000 acres of Federal mineral estate in the 6.8 million acre Planning Area.

There are 35 active oil fields and gas fields (comprised of 195,330 acres total with 28,200 acres of federal mineral estate) within the 6.8 million acre Planning Area. Twelve of the 35 active fields intersect Federal mineral estate. Since 1994, more than 1,000 wells have been drilled within the CCFO Planning Area; however, no well within the Planning Area was drilled on the Federal mineral estate, and none of the wells drilled in the Planning Area resulted in a new field discovery. In fact, during the past 30 years, only one new field was discovered within the CCFO Planning Area (the Bixler gas field, a very small 4-well, 1.5-square-mile gas field discovered in Contra Costa County in 1993). That field was abandoned in 2002.

The most productive oil and gas fields within the CCFO Planning Area are the Coalinga oil and gas field with Coalinga East Extension oil and gas field, San Ardo oil and gas field, Lynch Canyon oil and gas field, Jacalitos oil and gas field, Kettleman North Dome oil and gas field, and Sargent-Hollister oil and gas field (see Section 1; DOGGR, 2010). The major oil fields (Coalinga, Coalinga East Ext, San Ardo, Lynch Canyon, and Jacalitos) are located in Fresno and Monterey Counties. Of the total producing wells within the CCFO Planning Area, approximately 3 percent occur on Federal authorized leases; see Appendix B for additional details.

Minerals

Locatable minerals are those for which the right to explore, develop, and extract mineral resources on Federal lands open to mineral entry is established by the location (or staking) of lode or placer mining claims pursuant to the Mining Law of 1872. In general, metallic minerals are locatable; however, some nonmetallic minerals are also considered locatable. Generally, locatable minerals such as gold, silver, copper, lead, zinc, tungsten, mercury, chromium, manganese, antimony, uranium occur where a thermal heat source and mineral-bearing fluids (hydrothermal) form a lode deposit. Typically these hydrothermal deposits do not occur directly adjacent (laterally or vertically) to petroleum resource areas. Non-metallic deposits such as diatomaceous shale, diatomite, limestone, Fuller's earth, or dimensional stone may occur near petroleum reservoirs. Potential for locatable minerals exists throughout the mountainous and coastal regions, although only limited active mining occurs on or immediately adjacent to BLM-administered land.

Renewable Energy

Solar and wind energy development has increased in the last decade throughout California. Wind and solar development is approved pursuant to FLPMA right of way grants. Within the CCFO Planning Area, large solar development is planned for Panoche Valley in San Benito County, California Flats near the borders of Monterey, San Luis Obispo, Kings and Fresno Counties, the area near the community of Tranquility in Fresno County, and southwestern Merced County. Smaller projects, typically less than 20 MW and 200 acres in size, may occur elsewhere in the CCFO Planning Area; however, much of the CCFO Planning Area is characterized by rolling hills making it less appropriate for larger solar energy projects.

Wind energy potential is low in much of the CCFO Planning Area except in the Altamont Pass which has numerous wind farms, many of which date from the 1970s and are being upgraded as improved technology becomes available. None of the CCFO Decision Area mineral estate lands are mapped as having good wind resource potential (NREL, 2012).

3.2.4 Current Conditions and Trends

Central Coast Field Office Planning Area

Historic and recent levels of oil and gas exploration and development on BLM-administered land in the CCFO Planning Area have been low. The RFD Scenario estimates up to 37 new wells will be drilled primarily within high- to moderate-potential petroleum resource areas over the next 15 to 20 years.

There are various small abandoned mines and prospects, mainly for mercury, in the Clear Creek Serpentine ACEC, which is withdrawn from mineral entry under all alternatives considered in this EIS. The presidential proclamation establishing the Fort Ord National Monument declared the former Fort Ord military base closed to mineral location and leasing.

A shale quarry and limestone quarry for cement on lands surrounded by the Cotoni-Coast Dairies unit of the California Coastal National Monument was closed in 2010 (Alexander, 2010). Building stone mineral production occurs in the Williams Hill area in the Salinas Management Area.

Leases Subject to Settlement Agreement

The 14 non–No Surface Occupancy (NSO) leases as identified in Hollister I and Hollister II are located in a historically nonproductive wildcat area west of San Ardo Field (Leases CACA 052960, 052959, 053825, 053824, 053827, and 053826), and in or near the Vallecitos oil field (Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828). Well drilling, possibly well stimulation, and possibly development and production may occur on these leases. Although these leases either have not been issued or have been suspended, it is possible that some or all of the 37 exploratory or development wells could be drilled on these leases in the future.

3.3 Geology

This section describes the geology, faults and slopes in the CCFO Planning Area. The analysis addresses the existing geologic and seismic hazards that may potentially impact the project, in particular slope stability in work areas defined by new access roads and new well drilling pads. Earthquakes or seismic hazards related to strong shaking should be considered for the more permanent facilities in developed oil fields such as gathering lines, staging areas with chemical storage, and tank batteries.

3.3.1 Introduction

Soil erosion and slope stability, including landslides, are the principal geologic hazards related to new oil and gas facilities in the CCFO Planning Area. Erodible soils are common to the Planning Area as are geologic units prone to landslides or slope instability where disturbed by grading. Strong to very strong ground shaking and fault rupture due to earthquakes along major faults in the Planning Area should be anticipated.

In some cases, compliance with existing laws and regulations would serve to reduce or avoid certain impacts that might otherwise occur with the implementation of the project. In addition to Federal regulations that require operators to submit a permit application to BLM for new wells, California regulations also require operators to prepare and submit a permit application for new wells to DOGGR for review and approval, including any type of injection or well stimulation. DOGGR requires operators to disclose geologic features, including known faults, in applications for evaluation and considers existing fault data in evaluating the permit and its decision to either approve or deny the permit. These processes serve to reduce the potential seismic hazard impacts of well stimulation activities or fluid disposal in injection wells.

There has been public concern regarding induced seismicity from well stimulation treatments and concern that it appears to be related to injection of wastewater and not the fracturing of formations for enhanced oil production. Researched literature indicates the potential for induced seismicity from currently practiced well stimulation treatments and wastewater injection in California is low (DOC, 2015).

In California and the CCFO Planning Area, the injection/disposal of wastewater, flowback of stimulation fluids, produced water, and other oilfield process waters (collectively referred to as injected fluids) is considered Class II injection, and is regulated by DOGGR under its Underground Injection Program (UIC), authorized under the Federal Safe Drinking Water Act (SDWA). The UIC program is monitored and audited by the EPA SDWA. In California, the volume of flowback water from well stimulation is a very small percentage of total fluid produced from a field, so the impacts from the disposal of flowback fluids are anticipated to be negligible (CCST, 2014). Also, the volume of material injected for well stimulation represents a small fraction of the total injected fluids in any given petroleum field in California (DOC, 2015), so the impact from injecting the small volume of stimulation material is anticipated to be negligible. There has been no direct link of induced seismicity caused by oil and gas operations wastewater disposal in California and the overall seismic hazard is low (CCST, 2014).

3.3.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/EIS), refer to Appendix J.

3.3.3 Regional Setting

Regional Geologic Setting

The CCFO Planning Area in situated in the southern portion of the Coast Ranges Geomorphic Province, characterized by northwest trending mountain ranges and intervening valleys; the eastern edge of the San Joaquin Management Area extends into the Great Valley Geomorphic Province. Franciscan assemblage

rocks mapped as mélange, metavolcanic rock, greenstone, serpentinite, and gabbro form the basement terrane east of the San Andreas Fault. Granitic rock of the Salinian block form the basement west of the fault. The Salinian Block is comprised of Mesozoic granitic rock and Paleozoic to Mesozoic age meta-sedimentary rock. A narrow, far western basement terrane, again comprised of Franciscan Complex rocks, is located along the coast west of the Sur-Nacimiento fault.

Two main fault systems in the Coast Ranges juxtapose the basement terranes of different origins. The east part of the province is dominated by the San Andreas Fault and further west by the Sur-Nacimiento and Hosgri fault system, including the Rinconada fault. The Hayward and Calaveras faults, part of the San Andreas fault system, dominate the structural geology east of San Francisco Bay. A thick series of Jurassic-age through Tertiary-age sedimentary strata overlie much of the Franciscan basement and the Salinian block, and were deposited during marine transgressions and regressions during this timeframe. Several episodes of volcanism, indicative of crustal extension and normal faulting, occurred in some areas of the Coast Ranges during late Oligocene, Miocene, and Pliocene time, and produced shallow intrusive and volcanic deposits. Pinnacles National Park presents exposures of Miocene age shallow volcanic intrusives and pyroclastic breccia of rhyolitic composition. During Quaternary time, the region was uplifted to its current elevation and a combination of tectonic and geomorphic processes have shaped the present landscape, including the exposure of marine terraces, deposition of dune sand, and alluvial deposition which predominate in the large valleys (Salinas, San Joaquin, and Santa Clara).

3.3.4 Current Conditions and Trends

Faulting and Seismicity

The CCFO Planning Area is located in a seismically active area, as is the majority of coastal California. The numerous faults in California include active, potentially active, and inactive faults. Active faults have ruptured during the Holocene (approximately last 11,000 years), potentially active or Quaternary faults show evidence of movement in the last 1.6 million years; and inactive or pre-Quaternary age faults show no displacement in the last 1.6 million years (CGS, 2010).

Within the CCFO Planning Area, and BLM jurisdictional lands, active faults that are designated as Alquist-Priolo Fault Zones include the San Andreas, Calaveras, Hayward, San Gregorio, San Simeon, and Ortigalita faults. Also, there are many Quaternary and pre-Quaternary faults present within the CCFO Planning Area. Fault geometries in the Planning Area are mainly strike slip, reverse, and oblique. The 1906 San Francisco and 1989 Loma Prieta earthquakes are associated with the San Andreas fault system and were responsible for extensive damage in and around San Francisco Bay area. The 2003 San Simeon earthquake occurred on a previously unknown blind thrust fault (Hardebeck et al., 2004).

Faults can either act as traps for hydrocarbons or they can act as conduits for flow depending upon the nature of the fault. Consequently, oil fields and exploratory targets in California are frequently associated with faults (active and inactive).

For example, on May 2, 1983, a magnitude 6.7 earthquake occurred about 7.5 miles northeast of the town of Coalinga, approximately halfway between Los Angeles and San Francisco. The shock was felt from Los Angeles to 124 miles north of Sacramento and as far east as Las Vegas, Nevada. Unlike other well-documented, major earthquakes in California in the 20th century, this event was not associated with any previously known or suspected active fault. Comprehensive geologic and geophysical investigations begun soon after the event have demonstrated the absence of a near-surface fault responsible for the earthquake. Instead, the earthquake was closely associated with a fault zone concealed beneath folds developed along the structural boundary between the Coast (Diablo) Ranges and the San Joaquin Valley.

The proximity of the May 2 earthquake to the active oil fields on Anticline Ridge has led to speculation that this earthquake might have been triggered by oil-field operations. Elsewhere, earthquakes have been associated with pore-pressure increases resulting from fluid injection and with subsidence resulting from

fluid extraction. Simple calculations show that shale units, which underlie the oil-producing strata, hydraulically isolate the oil field from the earthquake focal region. The large volumes of fluid extracted from the oil fields caused a 50-percent decline in reservoir pressures from 1938 to 1983. These observations independently rule out substantial increases in pore pressure at focal depths due to fluid injection (USGS, 1989).

Geologic & Seismic Hazards

Surface Rupture. Fault rupture hazard is based on recency of faulting and recurrence interval between earthquakes capable of causing surface rupture. Historically active faults (activity during the past 200 years) are more likely to have future activity and surface rupture than Holocene active or Quaternary faults. In general, future faulting and surface rupture is most likely to occur on active faults. Many earthquakes occur without surface rupture and can result in significant damage to buildings and infrastructure.

Seismic Ground Shaking. Seismic ground shaking is the response to earth ground motions caused by the release of energy at the earthquake epicenter. The duration and intensity of the ground shaking is a function of the earthquake magnitude and distance from the earthquake epicenter. Large magnitude earthquakes on active faults in the CCFO Planning Area would result in strong and locally very strong ground shaking. Probabilistic determination of Peak Ground Acceleration (PGA) for the Planning Area ranging from 0.30 to 1.00g (30 to 100 percent of the acceleration due to gravity) should be anticipated during an earthquake in the next 50 years (2 percent probability of exceedance in 50 years). The largest PGAs are likely to occur along the San Andreas fault zone (USGS, 2015).

Liquefaction. Liquefaction is the phenomenon in which saturated granular sediments temporarily lose their shear strength during periods of earthquake-induced strong ground shaking. The susceptibility of a site to liquefaction is a function of the depth, density, pressure, and water content of the granular sediments and the magnitude and frequency of earthquakes in the surrounding region. Saturated, unconsolidated silts, sands, and silty sands within 50 feet of the ground surface are most susceptible to liquefaction. Liquefaction-related phenomena include lateral spreading, ground oscillation, flow failures, loss of bearing strength, subsidence, and buoyancy effects (Youd and Perkins, 1978). In addition, densification of the soil resulting in vertical settlement of the ground can also occur.

In order to determine liquefaction susceptibility of a region, three major factors must be analyzed. These include: (a) the density and textural characteristics of the alluvial sediments; (b) the intensity and duration of ground shaking; and (c) the depth to groundwater. Potentially liquefiable granular sediments of loose to medium density likely occur in the alluvium-filled valleys throughout the CCFO Planning Area. Salinas Valley and Santa Clara Valley present a liquefaction hazard, although no oil drilling activities are anticipated in these areas. Potential liquefaction hazard is not a consideration for portions of the Planning Area underlain by shallow bedrock, which is typical of the elevated areas in mountain ranges.

Landslides. Landslides and other seismically induced ground failures which may affect the CCFO Planning Area site include ground cracking, shattered ridgetops, and seismically induced landslides. Landslides triggered by earthquakes have been a considerable cause of earthquake damage; in central California large earthquakes such as the 1906 San Francisco and 1989 Loma Prieta earthquakes triggered landslides or slope failures that were responsible for destroying or damaging numerous structures, blocking major transportation corridors, and damaging life-line infrastructure. Areas that are most susceptible to earthquake-induced landslides are steep slopes in poorly cemented or highly fractured rocks, areas underlain by loose, weak soils, and areas on or adjacent to existing landslide deposits. Areas that are underlain by landslide prone units with moderate to steep slopes, and previously existing landslides, both mapped and unmapped, are particularly susceptible to this type of ground failure. Shattered ridgetop features consist of fractures, fissures, and minor slumps that are concentrated on narrow ridgelines. Studies suggest that amplification of ground motion at ridge tops is frequency dependent, potentially leading to differential motion at the top of the ridge,

which produces cracks and fissures at the crest. Oil well sites located in hillside areas within the CCFO Planning Area could be located in landslide and seismically induced landslide areas.

Expansive Soils. Expansive soils are characterized by their ability to undergo significant volume change (shrink and swell) due to variation in soil moisture content. Changes in soil moisture could result from a number of factors, including rainfall, landscape irrigation, utility leakage, and/or perched groundwater. Expansive soils contain a high percentage of clay particles (particularly smectite clay). The heaving pressures associated with soil expansion can damage structures, flatwork, and pipelines. Clayey soils may be encountered throughout the CCFO Planning Area. The expansion characteristics of clayey soils may vary locally and should thus be evaluated on a site-specific basis. Such an evaluation may include laboratory testing.

Land Subsidence. Land subsidence can be induced by any one of several different activities that involve large volume extraction of underground resources (water, oil and gas, sulfur, salt). Land loss associated with induced subsidence is common, especially where large volumes of fluids are removed from underground formations. This induced subsidence, which is either sub-regional or local in extent, has its greatest impact on flat coastal plains and wetlands near sea level where minor lowering of the land surface results in permanent inundation. Areas in the CCFO Planning Area are susceptible to land subsidence as evidenced by the measured ongoing impacts of groundwater withdrawals in the San Joaquin Valley by the USGS (USGS, 2017).

Central Coast Field Office Planning Area

Key geologic hazard issues in the CCFO Planning Area are fault rupture, strong ground shaking, and landslides. Liquefaction is not anticipated at oil well sites or existing oil fields where the project area is underlain by semi-consolidated Tertiary age deposits, older bedrock, and groundwater depths greater than 50 feet as explained under Geologic & Seismic Hazards. Expansive soils could be present at many oil well sites and existing oil fields and could cause pipeline damage or heave of building and tank foundations. Existing oil fields in the Planning Area are not directly adjacent to or across the San Andreas fault or other active faults, although surface rupture cannot be entirely dismissed. Strong ground shaking should be anticipated to occur at any of the active oil fields and exploratory well sites in the CCFO Planning Area. Finally, the moderate to locally steep terrain that occurs in some oil fields and that is sometimes composed of younger, poorly consolidated, or weak rock would be especially prone to landslides and slope failure. The majority of landslide hazard areas within the CCFO Planning Area that have been mapped by the California Geological Survey are located near the coast within Santa Cruz and Monterey Counties and on the hills surrounding the San Francisco Bay (CGS, 2015). Specific landslide areas would be identified and avoided or stabilized prior to any new construction activity.

Leases Subject to Settlement Agreement

The 14 non-NSO leases as identified in Hollister I and Hollister II are located in moderately sloping hillside areas underlain by sedimentary formations that may be susceptible to landslides. Grading for new access roads and drill pads could encounter existing landslides or destabilize slopes with weak soil or bedrock. Leases west of San Ardo (Leases CACA 052960, 052959, 053825, 053824, 053827, and 053826) are located near the potentially active late-quaternary Rinconada fault, with the fault crossing some of these leases (Lease CACA 053825, 053826, 053827, and 052960). The leases southeast of San Benito (Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828) are located between 6 and 12 miles from several faults and fault systems: San Andreas, Pine Rock, Panoche Hills, and the Great Valley thrust fault system. New access roads, drill pads, and gathering lines could experience fault rupture hazard during an earthquake. Both San Ardo and Vallecitos field locations would experience strong ground shaking from an earthquake on the Rinconada or San Andreas faults. Although these leases either have not been issued or have been suspended, it is possible that wells could be drilled on these leases in the future and could be affected by these geologic hazards.

3.4 Hazardous Materials and Public Safety

3.4.1 Introduction

As managers of the nation's public lands, the Bureau of Land Management (BLM) is responsible for the health and safety of visitors to public lands. This section addresses hazardous materials management on BLM-managed lands as well as associated risks to the public.

Public lands located within the four management areas of BLM's Central Coast Field Office (CCFO) have historically been used for a variety of military, industrial, agricultural, and commercial uses and, occasionally, illegal activities. Use of these lands, both legal and illegal, has resulted in the release of hazardous substances and the creation of hazardous waste sites. Some examples of human sources of hazardous materials on public lands include abandoned mine facilities and landfills, illegal dumping of hazardous materials, unexploded ordnance, and physical safety hazards associated with abandoned structures, oil spills, wire burns, cast-away equipment and radioactive material (BLM, 2015a). Other sources of hazardous materials within the CCFO Planning Area include naturally occurring materials, such as asbestos found in serpentine soils and mercury, chromium, and other heavy metals found in soils surrounding past mining operations (BLM, 2013). These materials also can be found at a distance from past mining operations because some of these naturally occurring hazardous materials have been eroded and transported via stormwater runoff to downstream depositional areas (BLM, 2013).

Through the Hazard Management and Resource Restoration (HMRR) Program commonly known as Hazardous Materials Management (HAZMAT), the CCFO engages in hazardous material emergency response actions, hazardous waste site evaluations, and prioritization of site remediation activities in accordance with Federal, State, and local laws and regulations. Site remediation and restoration are typically done in coordination with the U.S. Environmental Protection Agency (EPA), U.S. Department of the Interior Restoration Program, California environmental regulatory agencies such as the Department of Toxic Substances Control, the California Department of Fish and Wildlife Office of Oil Spill Prevention and Response, and the Regional Water Quality Control Boards, counties, and potentially responsible parties (both public and private). As part of the HMRR, hazardous material sites are inventoried in the BLM Abandoned Mine – Site Cleanup Module (AMSCM) database system (BLM, 2015b). This database helps to track and prioritize cleanup activities for identified hazardous material sites.

Section 3.4.2 presents relevant State and Federal regulations and standards associated with Hazardous Materials and Public Safety. Section 3.4.3 provides a description of the regional setting for Hazardous Materials and Public Safety. Section 3.4.4 provides a description of current conditions and trends in the CCFO Planning Area. Please refer to Section 4.4 for a summary of the direct and indirect impacts of the RMPA and the Hazardous Materials and Public Safety evaluation of the RMPA alternatives.

3.4.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/EIS), refer to Appendix J.

Types of Hazardous Substances

Hazardous substances are defined by Federal and State regulations that aim to protect public health and the environment. Hazardous materials have certain chemical, physical, or infectious properties that cause them to be considered hazardous. Hazardous substances are defined in the Federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 101(14), and also in the California Code of Regulations (CCR), Title 22, Chapter 11, Article 2, Section 66260 et seq.

In this analysis, chemicals mobilized and/or used at a site and released to the environment may result in their being considered a hazardous waste if the level of contamination exceeds specific CCR Title 22 criteria

or criteria defined in CERCLA or other relevant Federal regulations. California has similar laws and regulations for the handling, storage, and discovery of hazardous substances, as well as cleanup and disposal of hazardous materials and wastes. Cleanup and safe removal/disposal of hazardous wastes, including contaminated soil from prior oil production activities can be required if excavation of these materials becomes required. Even if soils or groundwater at a contaminated site do not have the characteristics required to be defined as hazardous wastes, remediation of the site may be required by regulatory agencies subject to jurisdictional authority. Cleanup requirements are determined on a case-by-case basis by the agency taking lead jurisdiction.

3.4.3 Regional Setting

Figure 1-2 shows the portions of the CCFO Planning Area indicating major oil and gas resource formations. The formations and sedimentary basins include Sacramento, San Joaquin, and Salinas Basins. Hazardous materials may be present at current oil and gas fields or well sites that would have further development or exploration, as discussed in the Reasonably Foreseeable Development Scenario (Appendix B). These materials may include existing soil contamination from spills and leaks that occurred previously and chemicals stored at drilling pads or staging areas.

Other hazards could include military munitions and explosives at the Fort Ord National Monument (former Fort Ord military base) and Fort Hunter Liggett. In accordance with the new management actions with this RMPA (ENERG-A1 in Chapter 2), Fort Ord National Monument is excluded from future mineral leasing. Other sources of hazardous materials within the CCFO Planning Area include naturally occurring materials, such as asbestos found in serpentine soils and mercury, chromium, and other heavy metals found in soils surrounding past mining operations (BLM, 2013). These materials also can be found at a distance from past mining operations because some of these naturally occurring hazardous materials have been eroded and transported via stormwater runoff to downstream depositional areas (BLM, 2013).

The California Division of Mines and Geology conducted an investigation in the mid-1950s that identified chrysotile asbestos as a major component of the New Idria Formation (BLM, 2013). Asbestos is a known carcinogen and exposure to airborne asbestos can lead to adverse health effects, including asbestosis and lung cancer. The identification of naturally occurring asbestos, as well as knowledge of potential adverse health effects from exposure to this naturally occurring hazardous material, led to the designation of the Clear Creek Serpentine Area of Critical Environmental Concern (ACEC) in 1984 (BLM, 2013). Recreational use of the Clear Creek Serpentine ACEC remains restricted to minimize human exposure to asbestos and has been closed to oil and gas leasing

In addition to the regional hazards described above, the CCFO Planning Area contains areas that are favorable to the growth of the "Valley Fever" vector, which is the fungus *Coccidioides immitis* (COSB, 2015). This fungus tends to occur in arid climates with hot, dry summers and moderate winters. Soil disturbing activities can mobilize airborne fungal spores which can infect construction personnel, 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 (COSB, 2015). For additional discussion of Valley Fever, please see Section 3.9 (Soil Resources).

Oil and Gas Facilities

Most of California's historic oil and gas production has been from conventional resources, or vertical wells, into traditional oil and natural gas reservoirs. Today, after recovery of some of the reservoirs' hydrocarbons, most of California's oil and gas reservoirs require some form of artificial lift, such as a pumping unit, to flow (DOC, 2015). Despite being a top producer of oil and gas resources and a major contributor to the nation's economy (responsible for approximately one-tenth of the United States' total production), production levels in California have shown a declining trend over the past 25 years.

The areas of the fields within the CCFO Planning Area are no exception; however, some operators have slowed or flattened the decline rate by applying enhanced oil recovery (EOR) technology (e.g., steam injection into heavy oil deposits). Information regarding the number of active wells and production in the primary fields in the CCFO Planning Area is summarized in Table 3.4-1 for 2014.

Table 3.4-1. Central Coast Field Office Area Oil and Gas Production (2014)

Basin	Field	Operator	Active Wells	Oil (Mbbl)	Gas (MMcf)
San Joaquin	Coalinga	Aera Energy	1,995	2,590.3	225
		Cal Energy	9	24.6	0
		Chevron USA	N/A	210.6	0
		Seneca	169	266.9	0
	Jacalitos	Crimson Resource Management	92	7.6	6.5
		HT Olsen O&G	19	5.8	0
Salinas	Lynch Canyon	Eagle Pet.	43	24.6	0
	San Ardo	Aera Energy	979	3,589.0	507
		NY Oil	43	25.3	0
		Vintage Prod.	19	75	3.5

Source: DOGGR, 2014

Characteristics of Crude Oil

This section discusses the properties of crude oil as it relates to safety risks, such as oil spills, toxic exposure, and fires.

All crude oils contain carbon, hydrogen, sulfur, nitrogen, oxygen, minerals and salts in varying proportions depending on their source. A crude oil spill could damage the environment if oil spilled on land, or in rivers, creeks, or the ocean, and could produce public safety concerns from fires that may arise if the oil burns. Flammable vapors (propane, butane, and pentane) may also emanate from the crude oil, and there may be safety hazards arising from toxic vapors in the crude oil (primarily benzene and hydrogen sulfide).

As crude oil emerges from the wellhead, is a heterogeneous mixture of solids, liquids and gases. This mixture includes sediments, water, salts, and acid gases, including hydrogen sulfide and carbon dioxide. The major hydrocarbon constituents include:

- **Alkanes (paraffins)** – straight-chain normal alkanes and branched iso-alkanes with the general formula CnH2n+2, where C stands for carbon and H stands for hydrogen. The major paraffinic components of most crude oils are in the C1 (=methane) to C35 range. The alkane composition in crude oils typically varies from 15 to 60 percent.
- **Cycloalkanes (naphthenes)** – saturated hydrocarbons containing structures with carbon atoms linked in a ring. The cycloalkane composition in crude oils worldwide typically varies from 30 to 60 percent.
- **Aromatic Hydrocarbons** – most commonly benzene, benzene derivatives, and fused benzene ring compounds. The aromatic composition in crude oils typically varies from 3 to 30 percent. The concentration of benzene in crude oils ranges between 0.01 percent and 1 percent.

The quality of crude oil is determined by a number of characteristics that affect the proportions of transportation fuels and petroleum products produced when the oil is refined. The two most common measurements of crude oil quality are the specific gravity and the sulfur content of the oil.

The specific gravity is typically measured using the American Petroleum Institute (API) standard or the API gravity of the crude oil (which is measured in degrees). The API gravity is the measure of the weight of crude oil in relation to the weight of water (water has an API gravity of 10 degrees).

Sulfur occurs in many natural compounds and as hydrogen sulfide (H_2S) in the crude oil. Total sulfur ranges from approximately 0.1 to 5 percent or higher by weight in crude oils, and hydrogen sulfide concentrations can reach 100 parts per million (ppm) in "sour" crudes. Crude oil is defined as "sweet" if the sulfur content is 0.5 percent or less by weight and "sour" if the sulfur content is greater than 1.0 percent. Other constituents of crude oil include nitrogen and oxygen compounds, water, and metal-containing compounds such as vanadium and nickel. Table 3.4-2 depicts crude oil properties.

Information pertaining to the crude characteristics from the most active fields in in the CCFO Planning Area is presented in Table 3.4-3.

Table 3.4-2. Crude Oil Properties

API Gravity (°)	
Light Crude	38–45
Medium Crude	28–38
Heavy Crude	12–28
Sulfur Content (percent by weight)[1]	
Sour Crude	0.8–5
Semi-Sweet Crude	0.5–0.8
Sweet Crude	0.1–0.5

1 - Total sulfur content; not equivalent to hydrogen sulfide (H_2S).
Source: http://www.petroleum.co.uk/composition, California Energy Commission.

Table 3.4-3. Crude Oil Characteristics of Active Fields in the CCFO Planning Area

Field	API Gravity (degrees API)	Depth, Average/Range	Sulfur Content (percent by weight)	Light Hydrocarbons (percent by weight)	County
Coalinga West Side	11-18	2000: 450/3500	0.75	N/A	Fresno
Coalinga East Extension	12-30	700-4600	0.64	N/A	Fresno
Jacalitos	31-39	3400	0.34	N/A	Fresno
San Ardo	13-14	2400: 2100/3025	2.3	2.1	Monterey
Lynch Canyon	N/A	N/A	N/A	N/A	Monterey

Source: DOGGR, 2014 and CEC 2006

The designation of "light" or "heavy" for crude oils is based on their density (API gravity is the common measure of crude oil density). Coalinga West Side and East Extension crude typically has an API gravity range of 11-30° and a sulfur content of approximately 0.75 percent and is thus characterized as heavy, semi-sweet crudes. San Ardo crude is also heavy but sour since it contains more sulfur. Jacalitos production would be considered a medium sweet crude.

Given heavy crude oil has lower levels of light end components (lower carbon number hydrocarbon constituents), it is less volatile and has little to no associate gas (C_1 to C_4) and hydrogen sulfide. For these crudes, the sulfur constituents are primarily in the form of mercaptans and thiophenes.

Produced Gas

Produced gas presents hazards in the form of toxicity, due to the presence of H_2S gas; flammability in the form of vapor cloud fires and explosions; and thermal radiation due to flame jet fires emanating from a gas pipeline leak or rupture.

Hydrogen sulfide is a toxic gas often present in the fluids extracted from wells. In the gas phase, it produces odors easily detected in ambient air at concentrations below 0.1 ppm, and it can produce injuries at levels equal to 30 ppm (ERPG [Emergency Response Planning Guidelines]-2) and fatalities as low as 100 ppm (ERPG-3) if exposed to for long enough periods (e.g., over 60 minutes). It has a characteristic "rotten egg" smell. A complicating factor that increases its hazards is that it also produces olfactory paralysis (loss of ability to smell) at levels as low as 50 ppm, or below those at which it could produce injuries or fatalities.

Table 3.4-1 above presents annual oil and gas production totals for the current operators in the four primary fields. Of the four operators in Coalinga, only one reported any gas production in 2014. For San Ardo, two of the three operators reported gas production. The production of gas is dependent on the location of the wells in the formation, and varies depending on the stimulation technique and age of the producing area. Areas of heavy crude production typically lack substantial associated gas production, and this is the case in the CCFO Planning Area, where limited gas production avoids the potential hazards of handling, processing, and transporting produced gas.

Well Stimulation Techniques and Enhanced Oil Recovery

Well stimulation treatments and EOR occur in the Planning Area, and while well stimulation technologies may be used, production using EOR is much more common in the Planning Area. Production through the use of EOR encompasses various techniques for increasing the amount of crude oil that can be extracted from an oil field over the life of a well. It is sometimes referred as tertiary recovery. The RFD Scenario in Appendix B of this EIS provides background information on the different types of EOR techniques and their application to California oil and gas development.

Water flooding, which is the most widely used secondary recovery method in the U.S., is also discussed in Appendix B, since it is used within the CCFO Planning Area. Water flooding includes injection of water into the reservoir, usually to increase pressure and thereby stimulate production, and also to sweep oil through the reservoir towards producing wells. Fields that have reported levels of gas production in Table 3.4-1 are likely to use water flood as a means of maintaining reservoir pressure.

Flowback (if a well is stimulated) and produced water are often injected into Class II wells for EOR. Based on data provided by DOGGR, there were approximately 35,000 active Class II[4] wells in California in 2013. Approximately 5 percent of these wells were used for water and gas disposal, while the remaining were used for EOR (i.e., cyclic steam, steam flood, and water flood) (DOC, 2015).

Also mentioned in Appendix B, the most recent available data indicates a total of 76 percent of production in 2009 was due to application of steam injection and water flood and techniques. About 85 percent of the production from the Coalinga Field is from thermal recovery projects according to DOGGR. EOR techniques are utilized in all of the most productive oil and gas fields within the CCFO Planning Area, which are listed as follows:

- Coalinga oil and gas field with Coalinga East Extension oil and gas field (steam flood, cyclic steam, and water flood);
- San Ardo oil and gas field (steam flood, cyclic steam, and water flood);
- Lynch Canyon oil and gas field (cyclic steam);
- Jacalitos oil and gas field (cyclic steam and water flood);
- Kettleman North Dome oil and gas field (water flood); and

In California, oil and gas well stimulation treatments may be used during well completion or within weeks or months after a well is put into production in order to keep it economically viable. Hydraulic fracturing, which is one type of well stimulation treatment, is the injection of water, a proppant (usually sand or ceramic beads) and carrier fluids (typically chemicals designed to enhance recovery yields) into a wellbore over one or two days at pressures sufficient to fracture the reservoir rocks. This increases the flow of hydrocarbons into the wellbore up to several hundred feet from the well. In California, it is typically applied in sandstone,

[4] Injection wells are classified by the U.S. Environmental Protection Agency into six classes according to the type of fluid they inject and where the fluid is injected. Class II wells inject fluids associated with oil and natural gas production operations. Most of the injected fluid is brine that is produced when oil and gas are extracted from the earth.

diatomite, limestone, or dolomite formations, and is conducted below the pressure at which the cap rock would fracture.

Service companies have developed a number of different oil and water-based fluids and treatments to more efficiently induce and maintain permeable and productive fractures during the hydraulic fracturing process. The composition of these fluids varies widely, from simple water and sand to complex polymeric substances with a multitude of additives. During the acid treatment step, hydrochloric acid (HCl), is one of the additives used and it cleans out wellbore and perforation holes and helps dissolve carbonate minerals and extra cement. The hydrochloric acid used is diluted with water to a 15 percent acid solution and the typical volumes of acid solutions pumped according to the EPA are 0.08 to 2.1 percent of total fluid pumped. Taking into account the lower concentration of HCl, and that the acid treatment step is not generally used in California due to the scarcity of carbonate rocks in the State, the potential risk to the public regarding hydrochloric acid is negligible.

3.4.4 Current Conditions and Trends

As discussed in Section 3.4.3, current active wells on BLM-administered land are in the San Joaquin Basin near the eastern side of the BLM administrative area. While there currently are no BLM active wells in the Salinas Basin, there are current authorized oil and gas leases on Federal mineral estate near the San Ardo Field, which is one of the large petroleum fields in California. Given the current activity on BLM lands near Coalinga, and the commercial interest in leases near San Ardo, current trends are focused on these plays. As discussed in the RFD Scenario in Appendix B, current development on BLM land in the Sacramento Basin is limited. Additionally, it has been classified by the California Council on Science and Technology (CCST, 2014) as an area of moderate conventional resource potential and low unconventional resource potential.

Central Coast Field Office Planning Area

Current BLM active wells are in the San Joaquin Basin, and these include the Coalinga East, Jacalitos, and Kettleman North Dome plays. The major plays in the Salinas Basin high potential area are San Ardo and Lynch Canyon.

Current and ongoing oil and gas development are almost exclusively occurring within the areas of high resource occurrence potential that are highlighted on Figure 5-1, within the San Joaquin and Salinas Basins. Maps in Appendix B show the locations of plays and active oil and gas wells within the CCFO Planning Area.

Leases Subject to Settlement Agreement

The 14 non-NSO leases as identified in Hollister I and Hollister II are located in a historically nonproductive wildcat area west of San Ardo field (DOGGR, 2007) and in or near the Vallecitos oil field, which is an area of limited production. The Department of Toxic Substances Control data management system (EnviroStor) environmental cleanup, permitting, enforcement, or investigation efforts for hazardous waste facilities or sites with known contamination was reviewed. Other than existing oil sites at the Vallecitos oil field (near Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828), EnviroStor does not identify any existing areas of contamination (DTSC, 2018).

3.5 Air Quality and Atmospheric Conditions

3.5.1 Introduction

Ground-level ozone and particulate matter are the major air quality concerns in the air basins within which the Central Coast Field Office (CCFO) is located. Generally, but with some exceptions, the air pollutant concentrations of ozone and particulate matter recorded by monitoring stations in these air basins do not meet Federal or State of California ozone air quality standards. Ozone is not a directly emitted pollutant; it forms in the presence of sunlight from oxides of nitrogen (NOx) and volatile organic compounds (VOC), including reactive organic gases (ROG). Ambient air concentrations of particulate matter, measured as respirable particulate matter (PM10) and fine particulate matter (PM2.5), also are found above Federal and State standards at many monitoring sites within the CCFO Planning Area. Particulate matter 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; PM2.5 is also indirectly formed in the atmosphere by the reaction of precursor gases that include sulfur oxides (SOx) and NOx, especially tailpipe emissions from off-road equipment and motor vehicles. Additional background information appears in the Air Quality Technical Support Document included as Appendix K of this Proposed RMPA/Final EIS.

3.5.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/EIS), and a description of the criteria pollutants refer to Appendix J.

Ambient Air Quality Standards

Ambient air quality standards have been established by both Federal and State legislation for a variety of air pollutants, known as criteria air pollutants. National "primary" standards represent thresholds above which may result in known impacts on human health. National "secondary" air quality standards define levels of air quality judged necessary to protect the public welfare from any known effects of an air pollutant, or to protect other resources, such as crops, vegetation, soil or water. The State of California has also established a set of ambient air quality standards for three additional pollutants (sulfates, hydrogen sulfide, and visibility reducing particles) to provide additional protection.

Attainment Status and Criteria Air Pollutants

The U.S. EPA, California Air Resources Board (ARB), and local air districts work together to classify each area as attainment, unclassified, or nonattainment 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 3.5-1, Table 3.5-2, and Table 3.5-3 summarize the attainment designations for both the Federal and State standards for the criteria pollutants in the North Central Coast, San Joaquin Valley, and San Francisco Bay Area air basins, respectively.

Table 3.5-1. Attainment Status for North Central Coast Air Basin

Pollutant	Federal Designation	California Designation
Ozone	Attainment	Nonattainment
PM10	Attainment	Nonattainment
PM2.5	Attainment	Attainment
CO	Attainment	Attainment / (but unclassified in San Benito and Santa Cruz Counties)
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment
Lead	Attainment	Attainment

Source: ARB, 2018; EPA, 2018.

Table 3.5-2. Attainment Status for San Joaquin Valley Air Basin

Pollutant	Federal Designation	California Designation
Ozone	Nonattainment (Extreme)	Nonattainment
PM10	Attainment (Maintenance)	Nonattainment
PM2.5	Nonattainment (Moderate)	Nonattainment
CO	Attainment (Maintenance)[1]	Attainment / (but unclassified in Merced County)
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment
Lead	Attainment	Attainment

1 - Metropolitan Stockton, Modesto, Fresno, and Bakersfield only.
Source: ARB, 2018; EPA, 2018.

Table 3.5-3. Attainment Status for San Francisco Bay Area Air Basin

Pollutant	Federal Designation	California Designation
Ozone	Nonattainment (Marginal)	Nonattainment
PM10	Attainment	Nonattainment
PM2.5	Nonattainment	Nonattainment
CO	Attainment (Maintenance)[1,2]	Attainment
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment
Lead	Attainment	Attainment

1 - Maintenance applies to the Bakersfield, Fresno, Modesto, and Stockton Metropolitan areas only.
2 - Maintenance applies to the San Francisco-Oakland-San Jose metropolitan areas only.
Source: ARB, 2018; EPA, 2018.

Local air districts are responsible for developing an air quality management plan (AQMP) or clean air plan (CAP) where necessary to attain the CAAQS, while the ARB develops and implements statewide air pollution control plans to achieve and maintain the NAAQS, known as the State Implementation Plan (SIP). Each local air district: develops the clean air strategies and air quality plans, such as an AQMP or CAP, for the attainment of ambient air quality standards; adopts and enforces rules and regulations concerning sources of air pollution; and issues permits for stationary sources of air pollution. Each air quality plan relies upon an emissions inventory and emissions control measures to demonstrate how the area will attain and maintain the ambient air quality standards.

Federal 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 SIP. This means that Federal agencies must make a determination that proposed actions in Federal nonattainment areas conform to the applicable EPA approved implementation plans (if pertinent) before the action is taken.

The regulations provide a phased process for meeting the General Conformity requirements of the CAA that begins with an applicability analysis before triggering a requirement for a conformity determination and subsequent review. Because Federal actions often do not result in a significant increase in emissions, the General Conformity regulations include a number of exemptions, including for actions that fall below *de minimis* emission levels based on the pollutant and nonattainment severity. As defined by 40 CFR 93.153, *de minimis* levels are the thresholds above which a conformity determination must be performed. Actions in areas that attain the national ambient air quality standards, for example in the North Central Coast air basin, are exempt from determining conformity with SIPs. Criteria pollutant *de minimis* rates that apply in the nonattainment and maintenance areas within the CCFO Planning Area are indicated in Table 3.5-4.

Table 3.5-4. General Conformity Applicability (*de minimis*) Levels

	San Joaquin Valley Air Basin		San Francisco Bay Area Air Basin	
Pollutant	**Federal Designation**	**General Conformity *de minimis* Level (tons per year)**	**Federal Designation**	**General Conformity *de minimis* Level (tons per year)**
Ozone (VOC or NOx)	Nonattainment (Extreme)	10	Nonattainment (Marginal)	100
PM10	Attainment (Maintenance)	100	Attainment	—
PM2.5	Nonattainment	100	Nonattainment	100
CO	Attainment (Maintenance)[1]	100	Attainment (Maintenance)[1]	100
NO_2	Attainment	100 (PM2.5 precursor)	Attainment	100 (PM2.5 precursor)
SO_2	Attainment	100 (PM2.5 precursor)	Attainment	100 (PM2.5 precursor)

1 - Metropolitan areas only.
Source: EPA, 2015.

3.5.3 Regional Setting

The CCFO Planning Area includes portions of three air basins. San Joaquin, Stanislaus, Fresno, and Merced Counties are in the San Joaquin Valley Air Basin. San Benito and Monterey Counties are in the North Central Coast Air Basin, which also includes Santa Cruz County. Additional Federal lands in Alameda, Contra Costa, San Mateo, and Santa Clara Counties are within the San Francisco Bay Area Air Basin.

The respective air districts managing air quality in the CCFO Planning Area have developed air quality plans that govern development and air pollution-producing activities within each air district. These plans consider the cumulative effects of all air pollution sources on the overall air pollution levels within each district. The ultimate goal of these plans is to maintain compliance with an air quality standard or to achieve compliance with an air quality standard if the air district is not in compliance.

3.5.4 Current Conditions and Trends

Meteorological Conditions

In general, the summer climate of California's coastal areas is controlled by high pressure centered over the northeastern Pacific Ocean. The summer period is rarely stormy due to the high-pressure center. During this period, precipitation is negligible and winds are generally from the northwest. Air from the northwest, passing over cold, upwelling water off the coast, frequently forms low clouds and/or fog along the coast. This generally tranquil weather period also is characterized by the presence of atmospheric temperature inversions which tend to inhibit the dispersion of air pollutants and allow for high air pollution potential.

During winter, the high pressure over the northeastern Pacific Ocean generally weakens and moves southward, allowing storms to occur more frequently. The summertime atmospheric temperature inversions and cold, upwelling water off the coast disappear during the winter, and wind speeds tend to be higher; these factors generally result in low air pollution potential. However, during winter, on occasions when the Pacific high-pressure area strengthens, strong atmospheric temperature inversions can develop near the land surface and winds weaken, resulting in high air pollution potential.

Several subclimates occur within the CCFO Planning Area. These are areas where local topography plays a significant role in modifying regional weather conditions. In the San Francisco Bay and North Central Coast regions, temperatures along the coast are milder especially in the summer, and there is less variation in day/night or seasonal temperatures than at inland locations. The San Joaquin Valley has generally cool, wet winters and hot, dry summers, and the air pollution potential is high because movement is constrained by the surrounding topography. Conditions within the North Central Coast vary due to the mountainous topography that protects inland areas including the Salinas Valley and traps air pollution; however, coastal areas have mild temperatures throughout the year and a lower air pollution potential. See also Section 3.6.4 for Current Conditions and Trends as related to climate change.

North Central Coast Air Basin

Air quality in the North Central Coast Air Basin is managed by the MBUAPCD. Seven air quality monitoring stations (Hollister, Salinas, Scotts Valley, Santa Cruz, Davenport, Carmel Valley, and Watsonville) in the basin collect data for determining compliance with Federal and State air quality standards. The National Park Service monitors air quality at Pinnacles National Park. Emissions of air pollutants in the North Central Coast Air Basin are much lower than those for the heavily populated San Francisco Bay Area or San Joaquin Valley air basins. The history of oil and gas exploration and development on Federal lands within the North Central Coast air basin is divided between Monterey County and San Benito County.

San Joaquin Valley Air Basin

Air quality in the San Joaquin Valley Air Basin is managed by the SJVAPCD. The San Joaquin valley is a relatively flat area at an elevation at or below 400 feet above sea level. Twenty-nine ambient air quality monitors are located throughout the air basin. Emissions in this air basin originate primarily from the urban lands and agricultural operations spread along a roughly north-south axis in the valley and from the oil and gas industry in the southern portion of the valley.

Emissions of all major criteria air pollutants have been trending downward since 2000; although during this same period, emissions of SOx, PM10 and PM2.5 remained relatively steady. Controls on motor vehicle

emissions are primarily responsible for these decreases, even though population and motor vehicle miles traveled in the air basin have increased substantially. Emissions of VOC also have decreased due to the implementation of stationary source controls on petroleum facilities in the air basin. The history of oil and gas exploration and development on Federal lands within the CCFO Planning Area portion of the San Joaquin Valley air basin is focused to Fresno County.

San Francisco Bay Area Air Basin

Air quality within the San Francisco Bay Area Air Basin is managed by the BAAQMD. Although the San Francisco Bay Area Air Basin is highly urbanized, criteria air pollutant concentrations are much lower in this air basin than in the San Joaquin Valley Air Basin, partly due to emissions reductions and partly due to more favorable weather conditions for transporting pollutants out of the air basin. The history of activity for oil and gas exploration and development on Federal lands within the CCFO Planning Area portion of the San Francisco Bay Area air basin is limited.

Leases Subject to Settlement Agreement

All 14 leases subject to the settlement agreement occur in the North Central Coast air basin and in the jurisdiction of the MBUAPCD. No leases subject to the settlement agreement are located in the San Joaquin Valley air basin or the San Francisco Bay Area air basin.

The leases subject to the settlement agreement that occur in southern Monterey County (Leases CACA 052960, 052959, 053825, 053824, 053827, and 053826) are approximately 20 to 50 kilometers to the southeast away from the Ventana Wilderness Class I Area and over 40 kilometers south of Pinnacles National Park. The leases subject to the settlement agreement that occur in San Benito County (Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828) are approximately 22 to 46 kilometers to the east of Pinnacles National Park and over 50 kilometers northeast of Ventana Wilderness.

3.6 Climate Change/Greenhouse Gas Emissions

3.6.1 Introduction

The global climate depends on the presence of greenhouse gases (GHG) to naturally provide the "greenhouse effect." The greenhouse effect stems from water vapor, aerosols, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and other GHGs that trap heat radiated from the Earth's surface. Globally, the presence of GHGs affects temperatures, precipitation, storm activity, sea levels, ocean currents, and wind patterns. Concentrations of CO_2 in the atmosphere have increased by more than 40 percent since the Industrial Revolution. Human activity contributes to emissions of six primary GHGs: CO_2, CH_4, N_2O, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). The standard definition of anthropogenic GHG includes these six substances under the 1997 Kyoto Protocol (UNFCCC, 1998).

The major source for the unprecedented increase in recent decades of the most important and widely occurring GHG pollutant, CO_2, is combustion of fossil fuels for energy. Fertilizer use, agriculture, and land use change are also major sources of increasing CH_4 and N_2O in the atmosphere. Natural carbon cycling by the terrestrial biosphere occurs through photosynthesis, CO_2 uptake by plants, and respiration, CO_2 release by plants, animals, and microorganisms (U.S. GCRP, 2014). Global emissions of CO_2 from fossil fuel combustion and cement production in 2011 were equivalent to 8.3 billion metric tons of carbon or 54 percent above the 1990 level (IPCC, 2013). The principal component of natural gas is CH_4, and it is also produced biologically under anaerobic conditions in ruminant animals, landfills, and waste handling. Along with CO_2, CH_4 is the second most important anthropogenic GHG in the atmosphere.

Each GHG has a global warming potential (GWP) that is calculated to reflect how long emissions remain in the atmosphere and how strongly the pollutant absorbs energy relative to CO_2. The GWP indicates the relative climate forcing of a given mass of emissions. Methane in the atmosphere over a 100-year horizon has a GWP of 25 according to the IPCC Fourth Assessment Report and 28 according to the IPCC Fifth Assessment Report, meaning that one pound of CH_4 causes the equivalent warming potential of 25 to 28 pounds of CO_2 (ARB, 2014a). When quantifying GHG emissions, the different GWP of each GHG pollutant is multiplied by the mass of that pollutant to arrive at a carbon dioxide-equivalent (CO_2e) mass.

3.6.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/EIS), refer to Appendix J.

3.6.3 Regional Setting

The oil and gas enterprise worldwide is responsible for a large fraction of the total GHGs emitted to the atmosphere. By far the largest factor in these emissions is burning the fuel, not producing it (CCST, 2014). Anthropogenic activity globally results in approximately 49,000 $MMTCO_2e$ of annual GHG emissions (IPCC, 2014), and the U.S. GHG inventory for 2012 was 6,526 $MMTCO_2e$ (EPA, 2015), or roughly 14 percent of the global emissions. The U.S. Geological Survey (USGS) published estimates of the GHG emissions resulting from the extraction and end-use combustion of fossil fuels produced on Federal lands in the U.S., as well as estimates of ecosystem carbon emissions and sequestration on those lands. Nationwide emissions from fossil fuels extracted from Federal lands in 2014 were 1,332 $MMTCO_2e$, based on the sum of the individual pollutants: 1,279.0 $MMTCO_2e$ for CO_2, 47.6 $MMTCO_2e$ for CH_4, and 5.5 $MMTCO_2e$ for N_2O (Merrill et al., 2018). Oil and gas production activities across the U.S., without accounting for refining or end-use, results in about 224 $MMTCO_2e$ annually (EPA, 2015), with about 18 $MMTCO_2e$ of annual GHG emissions being due to oil and gas extraction and processing activities before refining or end-use in California statewide (ARB, 2018).

The Third U.S. National Climate Assessment, released on May 6, 2014, and the Fourth U.S. National Climate Assessment, released on November 23, 2018, provide authoritative and comprehensive sources of scientific information about climate-change impacts across all U.S. regions and on critical sectors of the economy. For the Southwest U.S., including the CCFO Planning Area, the Third U.S. National Climate Assessment emphasized the risks to scarce water resources and states (U.S. GCRP, 2014):

> *Climate changes pose challenges for an already parched region that is expected to get hotter and, in its southern half, significantly drier. Increased heat and changes to rain and snowpack will send ripple effects throughout the region's critical agriculture sector, affecting the lives and economies of 56 million people — a population that is expected to increase 68 percent by 2050, to 94 million. Severe and sustained drought will stress water sources, already over-utilized in many areas, forcing increasing competition among farmers, energy producers, urban dwellers, and plant and animal life for the region's most precious resource.*

The Fourth U.S. National Climate Assessment includes seven key messages for the Southwest U.S., (U.S. GCRP, 2018), summarized here:

> *Water Resources. Water for people and nature in the Southwest has declined during droughts, due in part to human-caused climate change.*
>
> *Ecosystems and Ecosystem Services. The integrity of Southwest forests and other ecosystems and their ability to provide natural habitat, clean water, and economic livelihoods have declined as a result of recent droughts and wildfire.*
>
> *The Coast. Many coastal resources in the Southwest have been affected by sea level rise, ocean warming, and reduced ocean oxygen.*
>
> *Indigenous Peoples. Traditional foods, natural resource-based livelihoods, cultural resources, and spiritual well-being of Indigenous peoples in the Southwest are increasingly affected by drought, wildfire, and changing ocean conditions.*
>
> *Energy. The ability of hydropower and fossil fuel electricity generation to meet growing energy use in the Southwest is decreasing as a result of drought and rising temperatures.*
>
> *Food. Food production in the Southwest is vulnerable to water shortages. Increased drought, heat waves, and reduction of winter chill hours can harm crops and livestock; exacerbate competition for water among agriculture, energy generation, and municipal uses; and increase future food insecurity.*
>
> *Human Health. Heat-associated deaths and illnesses, vulnerabilities to chronic disease, and other health risks to people in the Southwest result from increases in extreme heat, poor air quality, and conditions that foster pathogen growth and spread.*

Climate Change Indicators and Evidence

Climate scientists make global-scale observations and construct models of the climate system. For the period 1950 onward, relatively comprehensive data sets of observations are available. Consensus expressed by the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) shows that: "warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased" (IPCC, 2013).

Changing temperatures, precipitation, storm activity, sea levels, ocean currents, and wind patterns are indicators and evidence of the effects of climate change. Various indicators and evidence illustrate the

many aspects of climate change, namely, how temperature and precipitation are changing, and how these changes are affecting the environment, specifically freshwater and marine systems, as well as humans, plants and animals (OEHHA, 2013; OEHHA, 2018). Since California's initial GHG strategy set forth in the 2008 AB 32 Scoping Plan, the scientific evidence has continued to indicate that the climate is changing. This evidence includes rising temperatures, shifting snow and rainfall patterns, and increased incidence of extreme weather events (ARB, 2014a).

3.6.4 Current Conditions and Trends

The effects of global climate change on California's public health, infrastructure and natural resources are described in the 2009 Biennial Report of the California Climate Action Team (CAT, 2009) and Our Changing Climate 2012 from the California Climate Change Center (CEC, 2012). The Climate Action Team findings include: "extreme events from heat waves, floods, droughts, wildfires and bad air quality are likely to become more frequent in the future and pose serious challenges to Californians. These impacts pose growing demands on individuals, businesses and governments at the local, State, and Federal levels to minimize vulnerabilities, prepare ahead of time, respond effectively, and recover and rebuild with a changing climate and environment in mind" (CAT, 2009). These findings are refined in *California's Fourth Climate Change Assessment Statewide Summary Report* (Bedsworth et al., 2018), which reinforces past findings regarding the potential for more extreme events from heat waves, floods, droughts, and wildfires. These extreme climate event impacts will create an increase in human mortality and damage to property that together will cost in the order of tens of billions of dollars.

Additional research by the CalEPA Office of Environmental Health Hazard Assessment (OEHHA) identifies climate change drivers, observed changes in climate, how natural physical systems respond, and emerging issues. The documented effects of climate change also include impacts on terrestrial, marine, and freshwater biological systems, with resulting changes in habitat, agriculture, and food supply. Examples of the terrestrial effects include increasing tree mortality, large wildfires, and changes in vegetation density and distribution (OEHHA, 2013). These changes are occurring in conjunction with the potential to impact human well-being (OEHHA, 2018). The OEHHA categorizes climate change indicators as: changes in California's climate; impacts to physical systems including oceans, lakes, rivers, and snowpack; and impacts to biological systems including humans, vegetation and wildlife. The primary observed changes in California's climate include increased annual average air temperatures, more-frequent extremely hot days and nights, and increasingly severity of drought. Impacts to physical systems affected by warming temperatures and changing precipitation patterns show decreasing snowmelt runoff, shrinking glaciers, and rising sea levels (OEHHA, 2018).

California Greenhouse Gas Emission Inventory

California's initial GHG management strategy was set forth in 2008 with the AB 32 Scoping Plan, when the State produced approximately 490 $MMTCO_2e$, an amount equal to about 540 million tons, according to the Air Resources Board inventory (ARB, 2015). For 2016, California's emissions were approximately 429 $MMTCO_2e$ (ARB, 2018) or less than one percent of the 49,000 $MMTCO_2e$ emitted globally. Within the "industrial" category of California's emissions, oil and gas production and processing activities before refining or end-use of the fuels accounts for roughly 18 $MMTCO_2e$ or 4 percent of California's GHG emissions. Table 3.6-1 summarizes the existing inventory for California.

Table 3.6-1. California GHG Emissions Inventory (million metric tons CO_2e per year)

Source Category	2008 ($MMTCO_2e$)	2010 ($MMTCO_2e$)	2012 ($MMTCO_2e$)	2014 ($MMTCO_2e$)	2016 ($MMTCO_2e$)
Transportation[1]	177.58	165.07	161.22	162.28	169.38
Industrial[2]	90.54	91.50	91.07	93.96	89.61
Electric Power	120.14	90.34	95.09	88.24	68.58
Commercial and Residential	43.52	45.05	42.89	37.37	39.36

Table 3.6-1. California GHG Emissions Inventory (million metric tons CO_2e per year)

Source Category	2008 ($MMTCO_2e$)	2010 ($MMTCO_2e$)	2012 ($MMTCO_2e$)	2014 ($MMTCO_2e$)	2016 ($MMTCO_2e$)
Agriculture	35.79	34.27	36.08	35.95	33.84
High GWP	11.65	13.52	15.54	17.70	19.78
Recycling and Waste	8.11	8.37	8.49	8.59	8.81
Total Emissions	**487.34**	**448.11**	**450.38**	**444.10**	**429.35**

1 - Transportation category includes off-road equipment used in construction, mining, oil drilling, and other vehicles and mobile sources.
2 - Industrial category includes refineries, oil and gas extraction, and other industries including combustion of fuels plus fugitive emissions.
Source: ARB, 2018. California Greenhouse Gas Inventory for 2000-2016, by Category as Defined in the 2008 Scoping Plan.

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The effects anticipated in the Central Valley provide an illustration of the potential changes: the number of days conducive to ozone formation in the San Joaquin Valley may rise by 75 to 85 percent by the end of the century; and sea-level rise may place additional pressure on the levee systems and increase the intensity of saltwater intrusion into coastal groundwater resources, leading to increased flooding and decreased freshwater availability (CAT, 2006; CAT, 2009). The California Climate Change Center notes that the agricultural resources of the Salinas Valley are particularly vulnerable (CEC, 2012).

Leases Subject to Settlement Agreement

All 14 leases subject to the settlement agreement occur in the North Central Coast air basin and in the jurisdiction of the MBUAPCD. There are no leases subject to the settlement agreement located in the San Joaquin Valley air basin or the San Francisco Bay Area air basin. The discussion of Climate Change Indicators and Evidence for California and the CCFO Planning Area would be the same for all leases. Oil and gas leasing and development that is subject to the settlement agreement would also be subject to the Regulatory Framework identified in Section 3.6.2 (see also Appendix J).

3.7 Groundwater Resources

This section provides a description of the affected environment for Groundwater Resources for the BLM-administered Federal mineral estate within the CCFO Planning Area. EIS Section 3.7.1 provides an introduction to Groundwater Resources. EIS Section 3.7.2 summarizes relevant State and Federal regulations and standards associated with this analysis. EIS Section 3.7.3 describes the regional setting for Groundwater Resources. EIS Section 3.7.4 discusses the current conditions for Groundwater Resources within the CCFO Planning Area, the leases subject to settlement agreement, and the four fields most likely to be used for future oil and gas development.

3.7.1 Introduction

Groundwater, one of California's most important natural resources, is essential to agriculture and other sectors of the economy, and provides 30 million Californians — about 75 percent of the population — with at least a portion of their drinking water (State Water Board, 2015). In a typical year, groundwater provides about 40 percent of California's urban and agricultural water demands. In extended or extreme drought years, this percentage increases to 60 percent or more. The California Department of Finance projects that California's population will grow to more than 49 million people in 2050, ensuring that people's demand for groundwater will increase.

Groundwater is the water occurring beneath the earth's surface that fills the voids in rocks or sediment. It can be found underlying nearly any location in California, including areas underlain by bedrock. Groundwater accounts for 99.9 percent of the water found within any given watershed -- and is the foundational resource for surface water expressions within a watershed. A large percentage of the groundwater used in California occurs in alluvial deposits of stream-laid unconsolidated to semi-consolidated gravel, sand, silt, and clay. These deposits typically occur in thin lenses and beds. Coarse-grained sediments (sand and gravel) usually provide the most economic source of groundwater and are identified as aquifers; finer-grained clay and silt deposits impede the movement and accumulation of groundwater and are referred to as aquitards.

A groundwater basin — typically underlying a valley or coastal plain — contains one or more connected and interrelated aquifers and often represents a groundwater reservoir capable of providing substantial water supply. The California Department of Water Resources (CDWR) defines groundwater basins throughout California, designating 515 basins and subbasins (CDWR, 2018). CDWR numbers the groundwater basins according to the boundaries of the nine Regional Water Quality Control Boards, three of which are within the CCFO Planning Area: San Francisco Bay (Region 2), Central Coast (Region 3), and Central Valley (Region 5). Many groundwater basins also overlay existing oil and gas fields. The CDWR-designated groundwater basins and oil and gas fields in the CCFO Planning Area are shown on Figure 3.7-1. The boundaries or limits of a groundwater basin often consist of low-permeability bedrock or a geologic structure such as a fault. The bottom often is bedrock or low permeability layer (generally less than 2,500 feet deep). In the deep Central Valley formations, the "base of fresh water" (i.e., the lowest depth where water contains less than 3,000 mg/l of total dissolved solids or TDS) is considered the bottom of a basin (CDWR, 2003).

All groundwater contains dissolved chemical constituents; the types and concentrations depend on the source, environment, and movement of the groundwater. A measure of the general mineral quality of groundwater is total dissolved solids (TDS) expressed in milligrams per liter (mg/L). Typically, groundwater has higher concentrations of TDS than surface water because of its longer exposure to soluble materials (especially salts) in rocks or sediments below ground. Moreover, groundwater salinity tends to increase with depth in a groundwater basin, reflecting the long, slow pathways that groundwater travels at depth, or in some cases, the presence of ancient seawater (connate water) that has not been flushed from deep marine sediments.

Most of the groundwater used in California contains TDS concentrations of less than about 3,000 mg/L. However, the desalination of brackish or saline groundwater supplies has increased significantly in the last two decades (CDWR, 2013a). This increase results from improved technology that has lowered the cost of treatment — a cost that has been justified in part through an increase in water demand. Increased water demand has also resulted in the increased use of lower-quality groundwater when appropriate.

Federal law defines underground sources of drinking water as groundwater that contains less than 10,000 mg/L TDS with certain exceptions. One exception covers groundwater found in hydrocarbon-producing aquifers. These exempted aquifers meet the definition for Underground Sources of Drinking Water, but have been exempted according to criteria provided in 40 CFR 146.4. Refer to the discussion of criteria in the State of California Underground Injection Control Program in Appendix J and the discussion of Exempt Aquifers in Section 3.7.4.

In September 2014, the Sustainable Groundwater Management Act (SGMA) was signed into law. This legislation provides a framework for sustainable management of groundwater resources by local Groundwater Sustainability Agencies. These agencies are responsible for producing groundwater sustainability plans that guide management of groundwater by local public agencies such a water district, irrigation district, or county government. Additional details of the Act are provided in Appendix J, Regulatory Framework.

CDWR has historically provided funding and technical support for groundwater management and, pursuant to Water Code Section 10920 et seq., has implemented the California Statewide Groundwater Elevation Monitoring (CASGEM) program. CASGEM is a statewide program primarily based on monitoring of groundwater levels by local parties. It also includes prioritization of California's 515 groundwater basins and subbasins using the following criteria:

- Overlying population
- Projected population growth
- Number of public supply wells
- Total number of wells
- Irrigated acreage
- Reliance on groundwater
- Groundwater impacts, including overdraft, subsidence, saline intrusion, and any other water quality degradation, and
- Any other information determined to be relevant by CDWR.

The prioritization is expressed in terms of very low, low, medium, or high. Of the 515 groundwater basins in California, 127 were assigned high and medium priority (CDWR, 2014a). Also, CDWR has defined critically overdrafted groundwater basins (CDWR, 2016). While the CASGEM program purpose for prioritizing basins is to help evaluate the need for additional groundwater level monitoring, the prioritization is also being used to prioritize the schedule for producing groundwater sustainability plans under SGMA. For this EIS analysis, the prioritization provides a reasonable assessment of the relative importance of groundwater basins statewide. (It is not intended to diminish the local importance of groundwater in the smaller-size or lower-use groundwater basins.) Accordingly, the basins and subbasins with medium and high and critically overdrafted rankings are identified in the regional discussions of the Affected Environment section to identify the State's priority groundwater supplies.

Estimated volumes of groundwater use for each groundwater basin and subbasin (as compiled by CDWR in connection with the CASGEM prioritization process) also are considered for the groundwater quantity impacts analysis. CDWR cautions that these groundwater use data are current estimates and may be

incomplete. Nonetheless, they represent the best available and most comprehensive groundwater use data that cover all of the State's groundwater subbasins.

3.7.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/EIS), refer to Appendix J.

3.7.3 Regional Setting

The EIS/RMPA study area consists of the CCFO Planning Area shown on Figure 3.7-1. The map includes CCFO Planning Area boundaries, CDWR groundwater basins and subbasins (designated by CDWR basin numbers), Federal mineral estate, and oil and gas fields (including abandoned fields). Federal mineral estate is shown in both green and purple to identify the Federal leases subject to the settlement agreement (in purple). As shown on Figure 3.7-1, the settlement agreement leases are generally located in the southern portions of the CCFO Planning Area in southern Monterey and San Benito Counties.

Also shown on Figure 3.7-1 is the area considered by BLM to contain the highest potential for oil and gas occurrence. This high-potential area generally covers the southern Salinas Valley of Monterey County, southeastern San Benito County (east of the San Andreas Fault zone), and the western flank of the San Joaquin Valley including portions of western Fresno, Merced, and Stanislaus Counties (Figure 3.7-1). Most of the Federal mineral estate in the CCFO Planning Area occurs within the areas of high-potential oil and gas occurrence.

As shown on Figure 3.7-1 and listed in Table 3.7-1, there are 41 active or abandoned oil and gas fields in the CCFO Planning Area. Only 13 of these fields contain Federal mineral estate (see fields in bold font in Table 3.7-1). All but one of these 13 fields (abandoned Quinado Canyon) are located within a portion of one or more CDWR groundwater basins or subbasins.

Table 3.7-1. Existing Oil and Gas Fields in the Central Coast Field Office Planning Area

County[1]		Oil and Gas Field	Within a Groundwater Basin?	Includes Federal Mineral Estate?
Alameda	1	Hospital Nose Gas (abandoned)	yes	no
	2	Livermore	yes	no
Contra Costa	3	Bixler Gas	yes	no
	4	Brentwood	yes	no
	5	Brentwood, East Gas	yes	no
	6	Concord Gas (abandoned)	yes	no
	7	**Dutch Slough Gas**	**yes**	**yes**
	8	Knightsen Gas (abandoned)	yes	no
	9	**Los Medanos Gas**	**yes**	**yes**
	10	Mulligan Hill Gas	no	no
	11	Oakley Gas (abandoned)	yes	no
	12	Oakley Gas, South	yes	no
	13	Pinole Point (abandoned)	no	no
	14	Rio Vista Gas	yes	no
	15	River Break Gas	yes	no
	16	Sand Mound Slough Gas (abandoned)	yes	no
	17	Sherman Island Gas	yes	no
	18	Van Sickle Island Gas	no	no
	19	**Willow Pass Gas (abandoned)**	**yes**	**yes**

Table 3.7-1. Existing Oil and Gas Fields in the Central Coast Field Office Planning Area

County[1]	Oil and Gas Field	Within a Groundwater Basin?	Includes Federal Mineral Estate?
Fresno	**20 Coalinga**	**yes**	**yes**
	21 Coalinga, East Extension	**yes**	**yes**
	22 Guijarral Hills	**yes**	**yes**
	23 Jacalitos	**yes**	**yes**
	24 Kettleman North Dome	**yes**	**yes**
	25 Kreyenhagen	no	no
	26 Pleasant Valley	**yes**	**yes**
Monterey	27 King City (abandoned)	yes	no
	28 Lynch Canyon	yes	no
	29 McCool Ranch	yes	no
	30 Monroe Swell	**yes**	**yes**
	31 Paris Valley	yes	no
	32 Quinado Canyon (abandoned)	**no**	**yes**
	33 San Ardo	**yes**	**yes**
San Benito	34 Bitterwater	yes	no
	35 Hollister	yes	no
	36 Vallecitos	**yes**	**yes**
San Mateo	37 Half Moon Bay	yes	no
	38 La Honda	no	no
	39 Oil Creek	no	no
Santa Clara	40 Moody Gulch (abandoned)	no	no
	41 Sargent	no	no

1 - No existing oil and gas fields in Merced, San Francisco, San Joaquin, Santa Cruz, or Stanislaus Counties.
2 - Oil and gas fields shown in **bold** contain Federal mineral estate.

Groundwater Basins in the CCFO Planning Area

There are 66 groundwater basins or subbasins that are either wholly or partially located within the CCFO Planning Area (Figure 3.7-1). These basins occur within portions of 4 of the 10 CDWR-defined hydrologic regions in the State: San Francisco Bay Hydrologic Region (basin designations 2-x on Figure 3.7-1), Central Coast Hydrologic Region (basin designations 3-x on Figure 3.7-1), the San Joaquin River Hydrologic Region (basin designations 5-22.07, 5-22.15, and 5-70; see Figure 3.7-1), and the Tulare Lake Hydrologic Region (basin designations 5-22.09, 5-22.10, 5-23, and 5-71; see Figure 3.7-1). For basins/subbasins in the San Joaquin River and Tulare Lake hydrologic regions (basin designations 5-x), only the western edges of the basins are contained within the CCFO Planning Area (Figure 3.7-1) (CDWR, 2003).

Four Basin Plans developed by the Regional Water Quality Control Boards list beneficial uses for groundwater in the CCFO Planning Area (CRWQCB-CCR, 2011; CRWQCB-CVR, 2011; CRWQCB-CVR, 2004, CRWQCB-SFBR, 2015). These plans designate municipal, agricultural, and/or industrial water supply for most of the groundwater basins/subbasins. Specific beneficial uses for groundwater in the basins/subbasins that contain Federal mineral estate are discussed in Section 3.7.4.

Although groundwater is used throughout the CCFO Planning Area, reliance on groundwater varies significantly from basin to basin. In general, groundwater use is lowest in the northern CCFO Planning Area, especially in the San Francisco Bay region where groundwater provides only about five percent of the total water supply (CDWR, 2003). In contrast, groundwater supplies more than 80 percent of the

demand in the southern and central portions of the CCFO Planning Area. Groundwater is also heavily used in areas along the eastern edge of the CCFO Planning Area.

Thousands of public and private wells have been drilled throughout the CCFO Planning Area to support domestic, irrigation, urban, industrial, and other beneficial uses. Information associated with these wells has been confidential historically and not available to the public. With the recent adoption of Senate Bill 83, the public (as of June 2015) can access well completion reports prepared by the well driller (California Water Code Section 13752). Even though the well completion reports are now available, the current status of each well is unknown. The timing and amounts of water pumped from any individual well are also unknown (except in the Seaside Groundwater Basin, where water rights have been adjudicated by the courts). Only summary information provided by State agencies such as CDWR is available for documentation of local groundwater use, as summarized in subsequent sections.

California drinking water systems that have completed source water assessments in compliance with the DWSAP program are published by county. For the 12 counties that are either wholly or partially contained within the CCFO Planning Area, approximately 1,721 systems (with 3,643 sources) have completed assessments associated with the DWSAP as listed below:

- Alameda – 21 systems; 79 sources
- Contra Costa County – 119 systems; 166 sources
- San Francisco County – 3 systems; 6 sources
- San Mateo County – 41 systems; 75 sources
- Santa Clara County – 91 systems; 366 sources
- Santa Cruz County – 80 systems; 167 sources
- San Benito County – 56 systems; 79 sources
- Monterey County – 297 systems; 529 sources
- San Joaquin County – 332 systems; 583 sources
- Stanislaus County – 223 systems; 466 sources
- Merced County – 117 systems; 223 sources
- Fresno County – 341 systems; 904 sources

Approximately 59 percent of these systems (and sources) are located in four counties of the adjacent San Joaquin Valley (San Joaquin, Stanislaus, Merced, and Fresno). Only small areas of these counties intersect the CCFO Planning Area, suggesting that the number of drinking water sources and source water assessments in the CCFO Planning Area is closer to about 700 systems and 1,500 sources. Due to security concerns, the actual locations of these sources are not publicly available.

Additional groundwater information is summarized below, organized by three general regions of the CCFO Planning Area (northern, central/southern, and eastern). This discussion is followed by more specific information on groundwater basins/subbasins that contain Federal mineral estate.

Groundwater Basins in the Northern CCFO Planning Area

Groundwater basins in the northern portion of the CCFO Planning Area are in the San Francisco Bay Hydrologic Region (basin designations 2-x on Figure 3.7-1), generally characterized by highly urbanized areas. Aquifers in this area are relatively thin in the smaller basins and moderately thick in the larger and more heavily developed basins such as the Livermore Valley (2-10) or the Santa Clara Valley (2-9.02) (Figure 3.7-1). Well depths range from about 100 feet to 500 feet and well yields range from less than 50 gallons per minute (gpm) to approximately 3,000 gpm. Land subsidence has been a major issue historically in the Santa Clara Valley (2.9-02) but has been mitigated, in part, through monitoring and groundwater management activities (CDWR, 2003).

Groundwater throughout the region is suitable for most urban and agricultural uses with only local impairments. Primary constituents of concern are TDS, nitrate, boron, and organic compounds. Due to the availability of imported surface water supplies, groundwater only supplies approximately five percent of the total water supply demand throughout the hydrologic region. Water quality data from almost 500 public water supply wells indicate that groundwater quality in about 85 percent of the supply wells meets all State primary maximum contaminant levels (MCLs) for drinking water. About 15 percent of the wells have constituents that exceed one or more MCLs (CDWR, 2003).

Groundwater Basins in the Central and Southern CCFO Planning Area

Groundwater basins in the central and southern CCFO Planning Area are located within a portion of the Central Coast Hydrologic Region (designations 3-x on Figure 3.7-1) and include basins/subbasins in Santa Cruz, Santa Clara, San Benito, and Monterey Counties. Aquifer systems range from small inland valleys and coastal terraces to relatively large alluvial valleys (CDWR, 2003).

Groundwater chemistry in the region is characterized by calcium sulfate to calcium-sodium bicarbonate-sulfate water types, related to the marine-derived sedimentary units in the region. Seawater intrusion is a major problem in the coastal basins of the region, including basins adjacent to Monterey Bay in the CCFO Planning Area (Figure 3.7-1) (CDWR, 2003). Potential risk of seawater intrusion in one basin along the Monterey Bay was the primary reason for an adjudication of water rights by the courts. This basin, Seaside Groundwater Basin (3-4.08; see Figure 3.7-1), is the only adjudicated basin in the CCFO Planning Area.

The region is heavily reliant on groundwater, providing about 83 percent of the total agricultural and municipal water demand (CDWR, 2003). One basin in the Central Coast Region, Scotts Valley Groundwater Basin (3-27), contains an EPA-designated Sole Source Aquifer (SSA) — the Santa Margarita Aquifer (EPA, 2015). The SSA Program was established under Section 1424(e) of the Safe Drinking Water Act and identifies aquifers that function as the sole or principal drinking water source of an area with no alternative supplies. The SSA Program has been used by communities to use federally funded projects to assist in protecting an SSA from contamination. The Santa Margarita Aquifer is the only SSA designated in the CCFO Planning Area (EPA, 2015).

Water quality data collected from about 83 percent of more than 700 public water supply wells indicate that groundwater quality meets State primary MCLs for drinking water. About 17 percent of the wells have constituent concentrations that exceed one or more MCL (CDWR, 2003).

Groundwater Basins along the Eastern CCFO Planning Area Boundary

Groundwater basins along the eastern edge of the CCFO Planning Area include portions of basins and subbasins in the San Joaquin River and Tulare Lake hydrologic regions (basin designations 5-x on Figure 3.7-1). These two hydrologic regions generally cover the San Joaquin Valley, which is the southern portion of the Central Valley of California. Although these regions cover very large groundwater basins, the CCFO Planning Area includes only a few small basins and narrow western segments of the larger San Joaquin Valley basins (Figure 3.7-1). However, these narrow segments are generally hydraulically contiguous with the larger groundwater basins to the east. Aquifers in the San Joaquin Valley basins are relatively thick, extending to depths greater than about 800 feet to 1,000 feet in some areas. Well yields are variable but range up to about 5,000 gpm in the more permeable portions of the San Joaquin Valley. In general, aquifers are thinner and well yields are lower in the portions of the basins within the CCFO Planning Area (CDWR, 2003).

Groundwater typically is of poorer quality along the eastern edge of the CCFO Planning Area due to elevated TDS values and local impacts from nitrates, boron, chloride, and pesticides/herbicides. The basins are heavily reliant on groundwater, accounting for about 30 to 40 percent of the agricultural and municipal water supplies (CDWR, 2003). Most of this groundwater use occurs outside of the CCFO Planning Area.

Significant land subsidence in the San Joaquin Valley -- Westside subbasin (5-22.09) has been documented and is continued to be monitored by the USGS (USGS, 2018).

Groundwater Basins Containing Federal Mineral Estate

Of the 66 groundwater basins and subbasins that overlap with the CCFO Planning Area, 20 contain Federal mineral estate in seven counties in the CCFO Planning Area — Alameda, Contra Costa, Fresno, Merced, Monterey, San Benito, and Santa Cruz. (Figure 3.7-1).

As shown on Figure 3.7-1, most of the Federal mineral estate lands lie outside of a groundwater basin or subbasin. Although groundwater also occurs beneath lands outside of groundwater basin or subbasin boundaries, in general groundwater resources are more limited, less used, and not as actively managed in these areas. In addition, less information may be available on the quality and quantity of groundwater outside of groundwater basin boundaries.

Table 3.7-2 presents summary information on the 20 groundwater basins and subbasins that contain Federal mineral estate. The table identifies the basin and subbasin (if applicable), along with the CDWR-designated basin number included on Figure 3.7-1. Also included is the CCFO Planning Area county in which most of the basin/subbasin resides. Oil and gas fields that intersect a portion of the basin/subbasin are identified by field numbers (see Table 3.7-1 for oil and gas field numbers and names). Table 3.7-2 also includes an estimate of how much groundwater is used in each basin/subbasin (CDWR, 2014a), an amount that varies widely with the size of the basin, local population, and availability of surface water supplies, among other factors. Some small, isolated subbasins in the southeastern study area are essentially un-used groundwater basins (e.g., Vallecitos Creek Valley), while one subbasin in the adjacent San Joaquin Valley (e.g., Delta Mendota subbasin) provides more than 500,000 acre-feet per year (AFY) for groundwater supply. However, as shown on Figure 3.7-1, the two high-use subbasins of the San Joaquin Valley are located mostly outside of the CCFO Planning Area; only small segments along the western boundaries occur in the CCFO Planning Area (see subbasin numbers 5-22.07 and 5-22.09 on Figure 3.7-1). For the basins/subbasins contained mostly within the CCFO Planning Area, three subbasins in the Salinas Valley of Monterey County represent the most groundwater use. As shown on Table 3.7-2, each of these three subbasins provide a groundwater supply of more than 100,000 AFY.

Table 3.7-2. Groundwater Basins in the CCFO Planning Area with Federal Mineral Estate

CDWR Groundwater Basin / Subbasin				Oil & Gas Field(s) in Basin?		Groundwater Usage (AFY)	CDWR Priority Ranking[2]
Basin Name	Subbasin Name	Number	County[1]	Y/N	Field No.		
Santa Clara Valley	Niles Cone	2-9.01	Alameda	N	—	29,600	medium
Clayton Valley	—	2-5	Contra Costa	Y	9, 19	189	very low
San Joaquin Valley	Tracy	5-22.15		Y	7	19,198	medium
	Delta-Mendota*	5-22.07	Fresno / Merced	N	—	509,687	high*
	Pleasant Valley	5-22.10	Fresno	Y	20, 21, 22, 23, 24, 26	47,383	low
	Westside*	5-22.09		Y	20, 21, 22, 24, 26	411,534	high*
Cholame Valley	—	3-5	Monterey	N	—	5,011	very low
Lockwood Valley	—	3-6		N	—	4,565	very low

Table 3.7-2. Groundwater Basins in the CCFO Planning Area with Federal Mineral Estate

CDWR Groundwater Basin / Subbasin			County[1]	Oil & Gas Field(s) in Basin?		Groundwater Usage (AFY)	CDWR Priority Ranking[2]
Basin Name	Subbasin Name	Number		Y/N	Field No.		
Peach Tree Valley	—	3-32		N	—	902	very low
Salinas Valley	Forebay Aquifer	3-4.04		Y	30	160,000	medium
	Upper Valley Aquifer	3-4.05		Y	30, 33	125,000	medium
	Paso Robles Area*	3-4.06		Y	33	120,215	high*
Bitterwater Valley	—	3-30	San Benito	N	—	3,023	very low
San Benito River Valley	—	3-28		N	—	946	very low
Gilroy–Hollister Valley	San Juan Bautista Area	3-3.04		N	—	13,530	medium
Hernandez Valley	—	3-31		N	—	0	very low
Panoche Valley	—	5-23		N	—	200	very low
Vallecitos Creek Valley	—	5-71		Y	36	0	very low
Santa Cruz Purisima Formation	—	3-21	Santa Cruz	N	—	15,000	medium
Pajaro Valley*	—	3-2		N	—	67,000	high*

1 - No groundwater basins with Federal mineral estate in San Francisco, San Joaquin, San Mateo, Santa Clara, or Stanislaus Counties.
2 - As part of the CASGEM basin prioritization process.
*Included on the CDWR List of Critically Overdrafted Groundwater Basins, January 2016 (CDWR, 2016).

In part, because of this relatively low reliance on groundwater, one-half of the 20 basins/subbasins with Federal mineral estate have been assigned a low- to very low-priority ranking by CDWR (Table 3.7-2). The remaining 10 basins/subbasins with Federal mineral estate are assigned a medium- to high-priority ranking, which triggers certain groundwater management planning requirements under SGMA. The high-priority groundwater basins/subbasins in Table 3.7-2 have also been included on the published List of Critically Overdrafted Groundwater Basins (CDWR, 2016). However, two of the high-priority basins/ subbasins (Delta-Mendota and Westside) and one of the medium-priority basins (Tracy) are located mostly outside of the CCFO Planning Area.

Additional local details on the groundwater basins/subbasins with Federal mineral estate, along with information on current conditions and trends, are provided in the following section.

3.7.4 Current Conditions and Trends

Since 2012, lower-than-normal precipitation has created drought conditions across California. In August 2015, during the prolonged drought, the National Drought Mitigation Center categorized more than 95 percent of the State as being under a severe drought and most of the State, including the CCFO Planning Area, categorized being in an extreme or exceptional drought (NDMC, 2015). The snowpack in the Sierra Nevada, which provides storage and runoff for the State's water supply during the dry season, was measured at five percent of average in April 2015, the lowest snowpack in 75 years (Pacific Institute, 2015). Water year 2014 was the driest in 119 years of records and the warmest year on record. These conditions have contributed to reduced streamflows, fallowed agricultural land, a drop in hydroelectric power generation, ecosystem stress or damage, rising water prices, mandatory water conservation programs, and a significant increase in groundwater pumping.

The scarcity of surface water sources has increased reliance on groundwater, and water levels have declined significantly in many areas including portions of the CCFO Planning Area. According to a CDWR map of changes in water levels, water level declines of up to about 25 feet from 2011 to 2013 were typical in wells located in the CCFO Planning Area (CDWR, 2013b). Water level data were limited in the southern CCFO Planning Area, but some of the largest declines in the State were measured several miles east of the southern CCFO Planning Area in the groundwater basins of the San Joaquin Valley. In some areas of the valley, water levels have declined more than 130 feet during the last four years (USGS, 2015). The increased use of groundwater has also contributed to overdraft conditions, groundwater quality degradation, and land subsidence locally throughout the State. A NASA study indicates that groundwater pumping in the Central Valley has caused land subsidence of over 13 inches from May 2014 to January 2015 in Corcoran, located east of the CCFO Planning Area in Kings County (NASA, 2015). Long-term drought not only increases reliance upon groundwater but also can significantly decrease the amount of recharge aquifers receive, thus increasing aquifer stress and overdraft.

The recent California drought was likely exacerbated by climate change (Williams et al., 2015) and, as a result of climate change, there is a greater than average probability that drought will become more commonplace in California. Warmer temperatures resulting from climate change can also mean that precipitation which historically fell as snow will fall as rain in the future resulting in more runoff and less aquifer recharge.

The California Statewide Groundwater Elevation Monitoring (CASGEM) priority rankings for basins with Federal mineral estate are summarized in Table 3.7-2 above. A single criterion of the CASGEM ranking relates to local groundwater impacts including overdraft conditions, seawater intrusion, and other factors relating to groundwater quality degradation. In January 2016, CDWR published a list of the State's 21 most critically overdrafted groundwater basins (CDWR, 2016). The six basins on the List of Critically Overdrafted Basins in the CCFO Planning Area, including the four with Federal mineral estate, are listed below (CDWR, 2016) and shown on Figures 3.7-2 and 3.7-3.

- Soquel Valley (3-1), Santa Cruz County
- Pajaro Valley (3-2), Santa Cruz and Monterey Counties (contains Federal mineral estate)
- 180/400 Foot Aquifer (3-4.01), Monterey County
- Paso Robles Area (3-4.6), Monterey County (and San Luis Obispo County outside of the CCFO Planning Area) (contains Federal mineral estate)
- Delta-Mendota (5-22.07), Stanislaus, Merced, and Fresno Counties (contains Federal mineral estate)
- Westside (5-22.09), Fresno County (contains Federal mineral estate)

Figures 3.7-2 (northern CCFO Planning Area) and 3.7-3 (southern CCFO Planning Area) show the same groundwater basin/subbasins boundaries as on Figure 3.7-1, but each basin/subbasin is color-coded to represent its respective CASGEM ranking. High-priority and medium-priority basins/subbasins are highlighted in orange and yellow, respectively (Figures 3.7-2 and 3.7-3). The six high-priority basins that are also on the List of Critically Overdrafted Basins are highlighted with orange stripes.

This discussion on general groundwater conditions in the CCFO Planning Area focuses on the 20 groundwater basins and subbasins containing Federal mineral estate. The description of each groundwater basin provides basic information on the location, size and geologic setting of the basin and the occurrence of groundwater. Data on groundwater storage, groundwater pumping, and groundwater quality address the magnitude of the resource, its general quality, and its beneficial uses. This information supports consideration of the importance of a groundwater basin on a statewide basis, recognizing that small, lightly developed, or poor quality basins may have great local significance. Much information was compiled from CDWR's Bulletin 118 Update, California's Groundwater (CDWR, 2003). It is recognized that many basins are carefully managed and monitored, and that substantial additional information is available from local

water agencies, which will be considered at the development stage. However, Bulletin 118 and recent CASGEM data provide consistent, comparable information for all groundwater basins/subbasins in the CCFO Planning Area.

The information presented on Figure 3.7-1 has been repeated at different scales on Figures 3.7-2 (northern area) and 3.7-3 (southern area) to better identify key features regarding boundaries of BLM parcels, oil and gas fields, and groundwater basins/subbasins.

The 13 oil and gas fields that contain Federal mineral estate (shown in bold on Table 3.7-1) are located across the CCFO Planning Area, but most of these fields occur in the southern area (Figure 3.7-3) where the largest portion of Federal mineral estate is present, including the leases subject to the settlement agreement. The three fields with Federal mineral estate in the northern area consist of gas fields (one abandoned) in Contra Costa County (Table 3.7-1 and Figure 3.7-2). Most of the remaining oil and gas fields with Federal mineral estate occur in the southern area along the western flank of the San Joaquin Valley (western Fresno County), along the southern Salinas Valley of Monterey County, or throughout the hills of the Coast Ranges in southern San Benito County. Regional cross sections of these three geologic settings have been prepared by DOGGR and are reproduced, in part, on Figure 3.7-4. The locations of the cross sections are shown on Figure 3.7-3. Although these cross sections are relatively old, they adequately represent the subsurface depths and conditions for the purposes of this groundwater analysis (CDOC, 1998). Specific oil and gas fields represented on the cross sections include the Vallecitos field in San Benito County, the San Ardo field in Monterey County, and the Coalinga field (including East Side, West Side, and the East Coalinga Extension fields) in western Fresno County (Figure 3.7-4).

Recent oil and gas development has been concentrated in four existing fields in the CCFO Planning Area: Coalinga and Jacalitos fields in western Fresno County and San Ardo and Lynch Canyon fields in Monterey County (Figures 3.7-3 and 3.7-4). Federal mineral estate occurs in each of these fields except for the Lynch Canyon field. In addition, a portion of each of these fields occurs in a groundwater basin (Table 3.7-1 and Figure 3.7-3). Based on DOGGR's well stimulation disclosures, there were 903[5] well stimulation treatments, including hydraulic fracturing, completed in California between January 2, 2014 and June 22, 2015. These well stimulation treatments were conducted in 12 oil and gas fields in California, none of which are within the CCFO Planning Area. Therefore, the source and volume of water needed for potential future hydraulic fracturing in these four fields is uncertain. According to DOGGR, hydraulic fracturing has not yet been proven effective in oil fields within the CCFO Planning Area. However, since these four fields are located, at least in part, within a groundwater basin, there is the potential that groundwater will be used to support oil and gas operations including hydraulic fracturing. As discussed more fully in Section 4.7.2, the average amount of water required for hydraulic fracturing in California is approximately 140,000 gallons per well[6], an amount equivalent to 0.4 AF (CCST, 2015a). For context, this amount is similar to the average annual household water use of 153,000 gallons (CCST, 2015a). In addition, the amount is small compared to the amount of groundwater being used in most groundwater basins (Table 3.7-2). However, two of the fields which include Federal mineral estate are within portions of critically overdrafted basins: the Coalinga field is within a portion of the Westside subbasin (5-22.09) and the San Ardo field is within a portion of the Paso Robles Area subbasin (3-4.06).

As described more fully in Section 4.7.2, CCST compiled water use data for 1,760 hydraulic fracturing events conducted in California from 2011 through June 2014 (CCST, 2015a). During this time, there was only one hydraulic fracturing event in the CCFO Planning Area, located in the Guijarral Hills field in Fresno County. This hydraulic fracturing event used 2,123,268 gallons (6.5 AF) of water (CCST, 2015a,

[5] According to DOGGR, there were 962 well stimulation treatments completed in California between January 2, 2014 and June 22, 2015. The data downloaded from DOGGR's website in August 2015 indicates 903.

[6] DOGGR indicates that the average water use for the disclosed well stimulation treatments between January 2, 2014 and June 22, 2015 is 110,000 gallons.

Appendix O), which is significantly above the average per well water use (0.4 AF). The Guijarral Hills field contains Federal mineral estate and is within a portion of the Westside subbasin (5-22.09), a critically overdrafted basin (CDWR, 2016).

For groundwater basins/subbasins that intersect portions of the 13 oil and gas fields on Federal mineral estate, additional information has been compiled to examine the subsurface relationships between protected groundwater and hydrocarbon-bearing zones. It is noted that the depth of the protected groundwater zones has not been identified over most of the CCFO Planning Area. To address this data gap near existing oil and gas fields, relevant available information has been examined. The depth to the base of fresh groundwater at each oil and gas field has been tabulated based on data published by DOGGR. The depths to the productive hydrocarbon zones have been compiled, with an emphasis on the shallow-most producing zone — assumed to be the zone closest to protected groundwater. In addition, available salinity data for water produced from the hydrocarbon zones (referred to as produced water) have been evaluated. Although hydrocarbon zones are exempt from the definition of protected groundwater, lower salinity values in produced water may indicate that protected groundwater (<10,000 mg/L TDS) is in close vertical proximity to the hydrocarbon zones. These data sets are pertinent to the analysis of potential impacts to protected groundwater from oil and gas production and hydraulic fracturing. This assertion is based on the simple supposition that less vertical separation between protected groundwater and hydrocarbon-bearing zones can suggest a greater potential for adverse impacts; conversely, greater separation may indicate a lesser potential for adverse impacts. This assumption and the accompanying impacts analysis are discussed in more detail in Section 4.7.

As discussed in Section 3.7.2, Regulatory Framework, aquifers can be designated by EPA and DOGGR as exempt as part of the UIC program to allow injection of wastewater into aquifers. By definition, exempt aquifers do not contain protected water. Exempt aquifers typically underlie the freshwater zone, overlie hydrocarbon zones, and usually do not extend laterally beyond the oil and gas field. There are some cases where exempt aquifers extend to the surface. As of May 2017, no aquifer exemptions have been approved by the EPA within the CCFO Planning Area (DOC and State Water Board, 2017). DOGGR and the State Water Board's review of the class II injection wells and aquifer exemptions, however, is still underway.

Descriptions of Groundwater Basins with Federal Mineral Estate

There are 20 groundwater basins overlain by Federal mineral estate in the CCFO Planning Area. To facilitate the discussion of groundwater in these basins/subbasins, the information is organized by County. Where basins/subbasins cross county lines, the information is included in the county where most of the basin/subbasin resides. For any of these 20 basins/subbasins that also contain at least a portion of an oil and gas field, data from those fields are also discussed. Data for the 20 basins/subbasins are summarized in Table 3.7-2. Information on the 13 oil and gas fields with Federal mineral estate is included in Table 3.7-3, which includes data used to examine the subsurface relationships between protected groundwater and hydrocarbon zones beneath Federal mineral estate, where data exist for both zones. Data from Table 3.7-3 are discussed with the groundwater basin/subbasin in which they occur.

Alameda County

Santa Clara Valley, Niles Cone Subbasin (2.9-01). The Niles Cone groundwater subbasin is in southern Alameda County and has a surface area of 103 square miles (Figure 3-7.2). The subbasin is bounded by Alameda County Water District boundaries on the north, the Santa Clara County border on the south, the Diablo Range on the east, and the San Francisco Bay on the west. The subbasin is dominated by an alluvial fan that was formed by Alameda Creek as it flowed toward the San Francisco Bay. The Hayward Fault impedes the flow of groundwater from west to east and separates the subbasin into two parts. The east side of the Hayward Fault is composed of one relatively homogeneous sand and gravel aquifer while the west side of the Hayward Fault is composed of a series of gently dipping aquifers separated by extensive clay

Table 3.7-3. Relationship Between Fresh Water and Hydrocarbon Zones in the CCFO Planning Area for Fields with Federal Mineral Estate

County[1]	Oil and Gas Field Name	Oil and Gas Field Number	Depth to Base of Fresh Water[2] (feet)	Depth to Hydrocarbon Zone (feet)		Difference Between Base of Fresh Water and Top of Hydrocarbon Zone (feet)	Water Salinity of Hydrocarbon Zone		TDS <10,000 mg/L? (Y/N)
				Upper	Lower		NaCl (mg/L)	TDS (mg/L)	
Contra Costa	Dutch Slough Gas	7	800	7,000	8,100	6,200	325–4,622	—	Y
	Los Medanos Gas	9	150-1,000	2,800	4,300	1,800–2,650	10,800	—	N
	Willow Pass Gas (abandoned)	19	150	1,500	3,100	1,350	—	—	
Fresno	Coalinga	20	2,100	500	700	500	1,600	5,700–6,800	Y
	Coalinga, East Extension	21	2,100	6,400	8,000	4,300	500	2,600	Y
	Guijarral Hills	22	2,000-3,250	7,900	10,700	4,650–5,900	2,400–7,870	4,500–9,300	Y
	Jacalitos	23	550	3,400	—	2,850	8,700–9,900	9,400–11,800	Y
	Kettleman North Dome	24	—	6,000	11,700	—	7,100–33,000	8,900–33,900	Y
	Pleasant Valley	26	2,300	6,644	9,144	4,344	11,300	15,700	N
Monterey	Monroe Swell	30	1,300-2,000	2,000	3,200	700–1,900	3,500	4,800–5,300	Y
	Quinado Canyon (abandoned)	32	1,800	2,030	—	230	4,200	—	Y
	San Ardo	33	1,000	2,000	2,400	1,000	1,700–6,000	4,300	Y
San Benito	Vallecitos	36	100-500	1,040	5,350	540–940	1,100–3,600	8,100–8,200	Y

1 - No oil and gas fields within Federal mineral estate in Alameda, San Mateo, Santa Clara Counties.
2 - Range provided, where available.

aquitards. Artificial recharge projects on the west side of the Hayward Fault since the 1960s have resulted in significant groundwater level recovery. Municipal/irrigation wells are, on average, approximately 2,000 feet deep and yield between approximately 650 and 3,000 gpm. Groundwater in storage in 1999-2000 was estimated to be 38,000 AF (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the Niles Cone subbasin as municipal, domestic, agricultural, and industrial supply (CRWQCB-SFBR, 2015). CDWR estimates groundwater use in the basin at 29,600 AFY and has assigned a medium-priority ranking to the subbasin as part of the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a). TDS concentrations range from 286 to 39,734 mg/L and averages 2,204 mg/L. TDS concentrations are highest along San Francisco Bay (CDWR, 2003).

The Niles Cone Subbasin contains Federal mineral estate but no oil and gas fields.

Contra Costa County

As shown on Figure 3.7-2 and Table 3.7-2, the groundwater basins on Federal mineral estate in Contra Costa County include the Clayton Valley groundwater basin and the Tracy subbasin.

Clayton Valley (2-5). The Clayton Valley basin is in northern Contra Costa County along the south side of Suisun Bay and has a surface area of 28 square miles (Figure 3.7-2). The basin is bounded by Mt. Diablo Creek on the east, the Concord Fault to the west, and the Mt. Diablo foothills to the south. The Pittsburg Plain basin (2-4) lies to the northeast, and the Ygnacio Valley basin (2-6) borders the basin on the southwest. Water bearing units consist of Recent and older alluvium with a combined thickness of over 700 feet. Aquifers are hydrologically connected to Suisun Bay. The older alluvial deposits are at the surface in the southern portion of the basin and provide the primary groundwater supply. The younger alluvial deposits consist of soft muds, peat, and loose sand located along Suisun Bay (CDWR, 2003).

The Basin Plan lists municipal and domestic supply as beneficial uses for groundwater in the Clayton Valley basin (CRWQCB-SFBR, 2015). CDWR estimates groundwater use in the basin at 189 AFY and has assigned the basin with a very low-priority ranking (Table 3.7-2) (CDWR, 2014a). TDS concentrations range from 328 to 864 mg/L and average 472 mg/L. Municipal and irrigation well yields average 200 gpm and are drilled to depths of 80 to 540 feet (average 209 feet). Domestic well depths range from 40 to 605 feet (average 217 feet) (CDWR, 2003).

The Clayton Valley groundwater basin intersects two oil and gas fields that contain Federal mineral estate — Los Medanos Gas and Willow Pass Gas (abandoned). As summarized on Table 3.7-3, the depth to the base of fresh water within these oil and gas fields ranges from 150 to 1,000 feet. The depth to the shallowest hydrocarbon zone ranges from about 1,500 to 2,800 feet. In the hydrocarbon zone, sodium chloride concentrations are 10,800 mg/L. The vertical separation between the base of freshwater and the top of the hydrocarbon zone ranges from 1,350 to 2,650 feet. Based on reported depths and salinity in the fields, the base of protected groundwater likely occurs within this zone (see Appendix J in DOC, 2015; DOC, 1998).

San Joaquin Valley, Tracy Subbasin (5-22.15). The Tracy subbasin has a surface area of 539 square miles (Figure 3.7-2). The subbasin is also in San Joaquin and Contra Costa Counties. The Mokelumne and San Joaquin rivers lie to the north, the San Joaquin River is to the east, the Diablo Range lies to the west, and the San Joaquin–Stanislaus County line is to the south. The Eastern San Joaquin subbasin (5-22.01) lies to the east, the Delta-Mendota subbasin (5-22.07) lies to south, and the Solano (5-21.66) subbasin of the Sacramento Valley groundwater basin lies to the north (CDWR, 2003).

Water bearing units consist of younger alluvium, flood basin, older alluvium, and Tulare Formation deposits. The alluvium is less than 100 feet thick and has high well yields if saturated. The flood basin deposits can be up to 1,400 feet thick, occur in the northern two-thirds of the subbasin, and have low well yields. The older alluvial fan deposits are 150 feet thick, occur at the surface between the foothills of the Coast Ranges and the Sacramento–San Joaquin Delta, and have moderate to high permeability. The Tulare Formation is

about 1,400 feet thick, crops out in the Coast Range foothills in the western portion of the subbasin, and dips eastward toward the valley axis. The Corcoran Clay is found at the top of the Tulare Formation and confines the underlying deposits. The eastern limit of the Corcoran Clay is near the eastern boundary of the basin. Larger wells are screened below the Corcoran Clay and can yield 3,000 gpm while smaller wells may be screened above the clay layer but water quality is generally poorer. The storage capacity for the Tracy-Patterson Storage Unit (which includes the southern portion of the Tracy subbasin) was estimated to be 4,040,000 AF (CDWR, 2003).

The Basin Plan lists groundwater beneficial uses in the Tracy subbasin as municipal, domestic, agricultural, and industrial service supply (CRWQCB-CVR, 2011). CDWR estimates groundwater use in the subbasin at 19,198 AFY and has assigned a medium CASGEM groundwater priority ranking to the subbasin (Table 3.7-2) (CDWR, 2014a). TDS concentrations range from 210 to 7,800 mg/L and average 1,190 mg/L. Municipal and irrigation wells are drilled to depths of 60 to 1,020 feet (average 352 feet) and yields are generally between 500 and 3,000 gpm. Domestic well depths range from 44 to 665 feet (average 188 feet) (CDWR, 2003).

The Tracy subbasin contains one oil and gas field on Federal mineral estate — Dutch Slough Gas. As summarized on Table 3.7-3, the depth to the base of fresh water within this oil and gas field is estimated at 800 feet. The depth to the hydrocarbon zone is 7,000 feet. The vertical separation between the base of freshwater and the top of the hydrocarbon zone is estimated at 6,200 feet thick. In the hydrocarbon zone, sodium chloride concentrations of produced water range from 325 to 4,622 mg/L. Although these concentrations would be expected to be lower than TDS concentrations, the values indicate relatively low salinities and may also indicate a deep zone of protected groundwater in this area (see Appendix J in DOC, 2015; DOC, 1998).

Fresno County

As shown on Figure 3.7-3, three subbasins of the San Joaquin Valley are the primary groundwater basins/ subbasins for the Fresno County portion of the CCFO Planning Area. As shown on the map, only a small portion of the Delta Mendota (5-22.07) and Westside (5-22.09) subbasins are contained within the CCFO Planning Area, but the entire northern half of the Pleasant Valley subbasin (5-22.10) is included. (Note: Pleasant Valley is the name of both a groundwater subbasin and an oil and gas field). A small portion of the Panoche Valley groundwater basin (5-23) is also located in Fresno County, but because it lies primarily within San Benito County, it is described below with other San Benito County basins/subbasins.

San Joaquin Valley, Delta-Mendota Subbasin (5-22.07). The Delta-Mendota groundwater subbasin covers 1,170 square miles in Stanislaus, Merced, Madera, and Fresno Counties (Figure 3.7-3). The subbasin is bounded on the west by the Coast Ranges, on the north by the Stanislaus/San Joaquin County line and the Tracy subbasin (5-22.15), on the south by the Fresno County line and the Westside subbasin (5-22.09), and on the east by the San Joaquin River and the Modesto (5-22.02), Turlock (5-22.03), Merced (5-22.04), Chowchilla (5-22.05), and Madera (5-22.06) subbasins. Only a narrow segment along the subbasin western boundary is included in the CCFO Planning Area (CDWR, 2003).

Historically, groundwater flow has been to the northwest, parallel to the San Joaquin River. Data published by CDWR in 2000 indicate that groundwater flows to the north and east, toward the San Joaquin River. Groundwater is present in the lower and upper zones of the Tulare Formation and the overlying shallow deposits where depth to water is approximately 25 feet. Thicknesses of these units are not available. Municipal/irrigation well depths are up to 800 feet and yield up to 5,000 gpm. Based on estimates completed in 1995, the total storage capacity is 30.4 million AF in the upper 300 feet and is 81.8 million AF to the base of fresh water (depth not available). In 1995, the estimated volume of groundwater in storage in the upper 300 feet was estimated to be 26.6 million AF (CDWR, 2003).

The Basin Plan lists beneficial uses for the Delta-Mendota subbasin as municipal, domestic, agricultural, and industrial supply, non-contact recreation, and wildlife habitat (CRWQCB-CVR, 2011). CDWR estimates groundwater use in the subbasin at 509,687 AFY (CDWR, 2014a). The subbasin has been assigned a high-priority ranking for the CASGEM basin prioritization program (CDWR, 2014a) and has also been placed on the List of Critically Overdrafted Groundwater Basins (Table 3.7-2) (CDWR, 2016). TDS concentrations range from approximately 200 to 6,000 mg/L, and are typically between 700 and 1,000 mg/L. Saline groundwater occurs within the upper 10 feet of ground surface in a large portion of the subbasin (CDWR, 2003).

The Delta-Mendota subbasin does not contain any oil and gas fields with the existing Federal mineral estate.

San Joaquin Valley, Pleasant Valley Subbasin (5-22.10). The Pleasant Valley groundwater subbasin covers 227 square miles in southern Fresno County and western Kings County (Figure 3.7-3). The subbasin is bounded on the north and west by the Coast Ranges, on the east by the Kettleman Hills and the Westside and Tulare Lake subbasins, and on the south by the Kern County subbasin. The water bearing units include the alluvium and Tulare Formation, both of which are up to 300 feet thick. These units are underlain by the San Joaquin Formation. The Pleasant Valley Subbasin is shown conceptually on the lower cross section on Figure 3.7-4. Municipal/irrigation wells are up to approximately 1,800 feet deep and yield up to 3,300 gpm. The total storage capacity is estimated to be 14.1 million AF and the estimated groundwater in storage to a depth of 1,000 was estimated in 1961 to be 4 million AF (CDWR, 2003).

The Basin Plan lists beneficial uses for the Pleasant Valley subbasin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CVR, 2004). CDWR estimates groundwater use in the subbasin at 47,383 AFY and has assigned the subbasin a low-priority ranking in the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a). TDS concentrations range from approximately 1,000 to 3,000 mg/L (CDWR, 2003).

The Pleasant Valley subbasin contains six active oil and gas fields with Federal mineral estate — Coalinga, Coalinga East Extension, Guijarral Hills, Jacalitos, Kettleman North Dome, and Pleasant Valley (note that Pleasant Valley is the name of both a groundwater subbasin and an oil and gas field). The geologic setting for these fields on the western flank of the San Joaquin Valley is illustrated by the regional cross section at the bottom of Figure 3.7-4. As summarized in Table 3.7-3, the depth to the base of fresh water ranges from ground surface to 3,250 feet across these fields. The depth to the top of the hydrocarbon zone ranges from about 500 feet (above portions of the subbasin) to about 7,900 feet. In the hydrocarbon zone, sodium chloride concentrations range from 500 to 33,000 mg/L and TDS ranges from 2,600 to 33,900 mg/L. The vertical separation between the base of the freshwater and the top of the hydrocarbon zone ranges from about 500 to 5,900 feet. The wide range in TDS values, depths, and separation between fresh water and hydrocarbons reflects the variable locations of the fields with respect to the groundwater basin (see Figure 3.7-4). Available data corroborate the relatively high TDS values in groundwater reported in the basin and the dip of the hydrocarbon zones from east to west (see Appendix J in DOC, 2015; DOC, 1998).

San Joaquin Valley, Westside Subbasin (5-22.09). The Westside subbasin covers 1,000 square miles in western Fresno County and western Kings County (Figure 3.7-3). The subbasin is bounded on the north by the Delta-Mendota subbasin, on the east by the San Joaquin River, Fresno Slough, and the Kings subbasin, on the southeast by the Tulare Lake subbasin, on the southwest by the Pleasant Valley subbasin, and on the west by the Coast Range foothills. Similar to the Delta-Mendota subbasin, only a narrow segment along the west side of the subbasin is contained within the CCFO Planning Area (CDWR, 2003).

The water bearing units include continental deposits that form an unconfined to semi-confined upper aquifer above the Corcoran Clay aquitard and a confined lower aquifer below the Corcoran Clay. The top of the Corcoran Clay is at a depth ranging from 500 to 850 feet and the lower aquifer is approximately 1,200 feet thick from the average base of the Corcoran Clay to the average base of fresh water. Municipal/irrigation well depths are up to 3,000 feet deep and yield up to 2,000 gpm. The storage capacity of the upper and

lower aquifers were estimated to be approximately 36.5 and 65 million AF, respectively. In 1961, the volume of groundwater in storage to a depth of 1,000 feet was estimated to be approximately 52 million AF (CDWR, 2003).

The Basin Plan lists beneficial uses for the Westside subbasin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CVR, 2004). CDWR estimates groundwater use in the subbasin at 411,534 AFY (CDWR, 2014a). The subbasin has been assigned a high-priority ranking for the CASGEM program (CDWR, 2014a) and has also been placed on the List of Critically Overdrafted Groundwater Basins (Table 3.7-2) (CDWR, 2016). TDS concentrations typically range from approximately 220 to 1,300 mg/L, but can exceed 10,000 mg/L in some places (CDWR, 2003).

The Westside subbasin contains portions of five active oil and gas fields on Federal mineral estate — Coalinga, Coalinga East Extension, Guijarral Hills, Kettleman North Dome, and Pleasant Valley. These fields and the subsurface relationships of groundwater and hydrocarbons beneath them are included in the previous description of the Pleasant Valley subbasin (5-22.10).

Merced County

As shown on Figures 3.7-2 and 3.7-3, the San Joaquin Valley, Delta-Mendota subbasin is the only groundwater basin with Federal mineral estate in the CCFO Planning Area portion of Merced County. The Delta-Mendota subbasin is also located in Fresno County and is described above.

Monterey County

Cholame Valley (3-5). Cholame Valley groundwater basin has a surface area of approximately 62 square miles and is located in the Coast Ranges of southern Monterey County and northern San Luis Obispo County (Figure 3.7-3). Groundwater flow direction is to the southeast. Based on CDWR's review of 18 well completion logs in the basin, wells are from 100 to 665 feet deep and penetrate both alluvial and consolidated rocks. Most of the well completion reports are for domestic wells. Wells in the basin yield an average of 1,000 gpm, but can yield up to 3,000 gpm (CDWR, 2003).

The Basin Plan lists beneficial uses for the Cholame Valley basin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR estimates groundwater use in the basin at 5,011 AFY and has assigned the basin a very low-priority ranking under the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The basin does not intersect any existing oil and gas fields with Federal mineral estate.

Lockwood Valley (3-6). Lockwood Valley groundwater basin has a surface area of approximately 94 square miles and is located in the Coast Ranges west of Salinas Valley in southern Monterey County (Figure 3.7-3). Groundwater is present in the unconsolidated alluvium along the San Antonio River and in the terrace deposits. Domestic wells are up to 30 feet deep, while municipal/irrigation wells are up to 1,000 feet deep and yield an average of 100 gpm. Based on well completion reports, the depth to water ranges from approximately 10 to 150 feet. The groundwater storage capacity is approximately 1 million AF (CDWR, 2003).

The Basin Plan lists beneficial uses for the Lockwood Valley basin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR estimates groundwater use in the basin at 4,565 AFY and has assigned the basin a very low-priority ranking in the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The basin does not contain any existing oil and gas fields with Federal mineral estate.

Peach Tree Valley (3-32). The Peach Tree Valley groundwater basin is a narrow northwest-southeast trending basin approximately 21 miles long and less than 1 mile wide mostly within Monterey County

(Figure 3.7-3). The basin is composed primarily of Quaternary alluvium with well depths ranging from 60 to 117 feet, based on four well completion reports. Based on well completion reports for wells drilled between 1953 and 1997, groundwater levels ranged from 35 to 65 feet (CDWR, 2003).

The Basin Plan lists beneficial uses for the Peach Tree Valley basin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR estimates groundwater use in the basin at 902 AFY and has assigned the basin a very low-priority ranking in the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The Peach Tree Valley basin does not contain oil and gas fields with Federal mineral estate.

Salinas Valley, Forebay Aquifer Subbasin (3-4.04). The Salinas Valley groundwater basin contains eight subbasins, three of which contain Federal mineral estate including the Forebay Aquifer (3-4.04), Upper Valley Aquifer (3-4.05), and Paso Robles Area (3-4.06) subbasins (Figure 3.7-3). The Forebay Aquifer subbasin covers approximately 147 square miles in the central portion of the Salinas Valley. The subbasin is located between the 180/400 Foot Aquifer and Eastside Aquifer subbasins to the north, the Upper Aquifer subbasin to the south, and surrounded by the Gabilan Range on the east and the Sierra de Salinas on the west. The Forebay Aquifer subbasin was once split into the Upper Forebay area (formerly basin number 3-4.04) and the Lower Forebay area (formerly basin number 3-4.03), but has been combined into one subbasin (CDWR, 2003).

Groundwater flow direction is to the northwest, along the axis of the valley. The primary water bearing units are the 180-Foot Aquifer and the 400-Foot Aquifer. The average thickness of the 180-Foot Aquifer and 400-Foot Aquifer is 100 and 200 feet, respectively. There is a deeper aquifer, the 900-Foot Aquifer or the Deep Aquifer, which has not been significantly developed. Municipal/irrigation well depths range from 120 to 807 feet and average 349 feet. The subbasin has an estimated 5.7 million AF of groundwater storage capacity and in 1994, there was approximately 4.5 million AF in storage. According to CDWR, 2003, the depth to the base of fresh water ranges from approximately 200 feet at the eastern Valley margin to 2,200 feet at the western Valley margin (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the Forebay Aquifer subbasin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR estimates groundwater use in the subbasin at 160,000 AFY and has assigned the subbasin a medium-priority ranking under the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a). TDS concentrations for groundwater range from 300 to 1,100 mg/L (CDWR, 2003).

The subbasin contains a portion of one oil and gas field with Federal mineral estate — Monroe Swell. As summarized in Table 3.7-3, the depth to the base of fresh water within the Monroe Swell field is estimated at 1,300 feet to 2,000 feet. The depth to the top of the hydrocarbon zone ranges from approximately 2,000 to 3,200 feet. Because the shallowest hydrocarbon zone depth (2,000 feet) is located in an area where the reported base of the fresh water is 1,300 feet deep, the smallest vertical separation between the base of fresh water and the top of the hydrocarbon zone is estimated at about 700 feet. Deeper zones in other parts of the field provide an estimated vertical separation of about 1,900 feet. In the hydrocarbon zone, a sodium chloride concentration is reported at 3,500 mg/L and TDS ranges from 4,800 mg/L to 5,300 mg/L. These salinities are in the range of TDS values for protected groundwater. The reported depths and TDS values associated with the Monroe Swell field indicate that protected groundwater may be in close proximity to hydrocarbon-bearing zones (see Appendix J in DOC, 2015; DOC, 1998).

Salinas Valley, Upper Valley Aquifer Subbasin (3-4.05). The Upper Valley Aquifer subbasin has a surface area of approximately 153 square miles located in the central/southern region of the Salinas Valley groundwater basin, between the Forebay Aquifer (3-4.04) and Paso Robles Area (3-4.06) subbasins (Figure 3.7-3). The subbasin is surrounded by the Gabilan Range on the east and the Sierra de Salinas and Santa Lucia Range on the west. Groundwater flow direction is to the northwest, along the axis of the valley. The

primary aquifer is unconfined and within the Paso Robles Formation, alluvial fan and river deposits. Municipal/irrigation well depths range from 93 to 600 feet and average 235 feet. The subbasin has an estimated 3.1 million AF of groundwater storage capacity and in 1994, there was approximately 2.5 million AF in storage (CDWR, 2003). According to CDWR, 2003, the depth to the base of fresh water ranges from approximately 200 feet in the southern area of the subbasin to approximately 1,000 feet in the northern area of the subbasin.

The Basin Plan lists beneficial uses for groundwater in the Upper Valley Aquifer subbasin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR estimates groundwater use in the subbasin at 125,000 AFY, and has assigned the subbasin a medium-priority ranking in the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a). As a result of poor quality surface water recharge from the Gabilan Range, groundwater along the eastern side of the subbasin has elevated TDS concentrations. TDS in the basin ranges from approximately 140 to 3,700 mg/L (CDWR, 2003).

The subbasin contains portions of two oil and gas fields involving Federal mineral estate: Monroe Swell and San Ardo. Details on the Monroe Swell field are summarized in the description of the Forebay Aquifer subbasin included above. The regional geologic setting of the San Ardo field is represented on a cross section across the Salinas Valley on Figure 3.7-4. As summarized on Table 3.7-3, the depth to the base of fresh water at the San Ardo field is reported to be 1,000 feet. The depth to the top of the hydrocarbon zones ranges from about 2,000 feet to 2,400 feet (Table 3.7-3). The vertical separation between the base of the fresh water and the top of the hydrocarbon zone is estimated at about 1,000 feet. In the hydrocarbon zone, sodium chloride concentrations range from 1,700 to 6,000 mg/L with a TDS value of 4,300 mg/L reported for a portion of the main area in the field. TDS and depth data indicate that protected groundwater is likely in close proximity to the hydrocarbon zones (see Appendix J in DOC, 2015; DOC, 1998).

Salinas Valley, Paso Robles Area Subbasin (3-4.06). The Paso Robles Area subbasin covers approximately 932 square miles in both Monterey and San Luis Obispo Counties immediately south of the Upper Aquifer Valley subbasin (Figure 3.7-3). The subbasin is bounded on the south by the La Panza Range, on the east by the Temblor Range, and on the west by the Santa Lucia Range. Groundwater flow direction is to the northwest. The Paso Robles Formation is the primary water-bearing unit and reaches a thickness of up to 2,000 feet. The shallow alluvium, which ranges from 30 to 130 feet thick, has well yields that can exceed 1,000 gpm. In general, well yields in the subbasin range from 500 to 3,300 gpm. Estimates of storage capacity in the subbasin vary. CDWR, 1975, estimates total storage capacity to be 6.8 million AF whereas Fugro West, 2001, estimates storage capacity at more than 30.4 million AF. The average annual groundwater in storage between 1980 and 1997, as estimated by Fugro West, 2001, was 30.5 million AF (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the Paso Robles Area subbasin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR estimates groundwater use in the basin at 120,215 AFY and has assigned the basin a high-priority ranking in the CASGEM basin prioritization program (CDWR, 2014a). As previously mentioned, the basin has also been placed on the recently published List of Critically Overdrafted Groundwater Basins (Table 3.7-2) (CDWR, 2016). According to CDWR, TDS concentrations range from 346 to 1,670 mg/L and average 614 mg/L (CDWR, 2003).

The Paso Robles Area subbasin contains a portion of the San Ardo field, a small area of which occurs on Federal mineral estate. Data from this oil and gas field are included in the description of the Upper Valley Aquifer subbasin (3-4.05), provided above.

San Benito County

As shown on Table 3.7-2 and Figure 3.7-3, the groundwater basins on Federal mineral estate in San Benito County are Bitterwater Valley, San Benito River Valley, Gilroy–Hollister Valley, Hernandez Valley, Panoche Valley, and Vallecitos Creek Valley.

Bitterwater Valley (3-30). The Bitterwater Valley basin is in the Coast Ranges and consists of several valleys bounded by the Bear Valley Fault to the north and the San Andreas Fault Zone to the east. The basin is up to 18 miles long and 6 miles wide in the southwestern portion of the County and covers 50 square miles (Figure 3.7-3). Middle or lower Pliocene marine rocks bound the basin to the south and west. The valley areas consist of Quaternary alluvium and Plio-Pleistocene nonmarine rock. Groundwater flow is generally south to the Salinas River Valley. Well depths range from 67 to 390 feet and average 187 feet (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the Bitterwater Valley basin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR estimates groundwater use in the basin at 3,023 AFY and has assigned the basin a very low-priority ranking for the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The Bitterwater Valley basin does not contain any oil and gas fields with Federal mineral estate.

San Benito River Valley (3-28). San Benito River Valley groundwater basin has a surface area of approximately 38 square miles and is located within the San Benito River Valley (Figure 3.7-3). The basin is bounded by fault contacts and there is no information about groundwater flow within or across basin boundaries. Based on CDWR's review of 33 well completion reports, well depths ranged from 36 to 600 feet and well yields were up to 2,000 gpm. Groundwater levels ranged from four to 59 feet based on well completion reports for wells constructed between 1955 and 1989 (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the San Benito River Valley basin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011).CDWR estimates groundwater use in the basin at 946 AFY and has assigned the basin a very low-priority ranking for the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The San Benito River Valley basin does not contain oil and gas fields with Federal mineral estate.

Gilroy–Hollister Valley, San Juan Bautista Area Subbasin (3-3.04). The San Juan Bautista Area subbasin encompasses 116 square miles in the southwest portion of the of the Gilroy-Hollister basin in northern San Benito County (Figure 3.7-3). The Sargent Fault and anticline and the Bolsa subbasin lie to the north, the San Andreas Fault and the Gabilan Range are to the southwest, and the Calaveras Fault and Hollister subbasin are to the east. Groundwater occurs in alluvium and Purisima Formation. Alluvial thickness ranges from 0 to 300 feet and the Purisima Formation thickness can range from the surface to several thousand feet. Consolidated rocks of the Jurassic age are believed to underlie the Purisima Formation (CDWR, 2003).

The Calaveras and Sargent faults that bound the subbasin restrict groundwater movement. The storage capacity of the entire Gilroy-Hollister basin is estimated at 932,000 AF but groundwater storage information for the subbasin is not readily available from CDWR. Well yields average 400 gpm. Groundwater generally flows to the northwest (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the San Juan Bautista Area subbasin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR estimates groundwater use in the subbasin at 13,530 AFY and has assigned a medium-priority ranking to the subbasin for the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The San Juan Bautista Area subbasin does not contain any oil and gas fields with Federal mineral estate.

Hernandez Valley (3-31). The Hernandez Valley basin is a small 4-square-mile basin (2,860 acres) in the Coast Ranges in southern San Benito County (Figure 3.7-3). Pliocene marine rocks lie to the northeast, the Franciscan Formation forms the northwest boundary, Lower Miocene marine sediments are to the north, and Upper Cretaceous marine sediments are to the south and southwest. The basin consist of alluvium and a small area of nonmarine terrace deposits. The Hernandez Reservoir occupies most of the southern basin. Well depths range from 20 to 160 feet and average 58 feet (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the Hernandez Valley basin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011), although CDWR data indicate very low groundwater use in the basin (<100 AFY) (CDWR, 2014a). The basin is assigned a very low-priority ranking in the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The Hernandez Valley basin does not contain any oil and gas fields with the existing Federal mineral estate.

Panoche Valley (5-23). The Panoche Valley basin encompasses 52 square miles in the Coast Ranges in eastern San Benito County (Figure 3.7-3). A very small portion of the basin extends into Fresno County. The Franciscan Formation lies to the northwest, Upper Cretaceous marine sedimentary rocks lie to the northeast and southeast, and Lower Miocene marine rocks lie to the southwest. Water bearing units may include alluvium, nonmarine terrace deposits and nonmarine sediments. Groundwater flow is generally to the east toward Tulare Lake. Well depths ranged from 171 to 1,500 feet and generally encounter alluvial materials including gravels, sands, silts and clays (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the Panoche Valley basin as municipal and domestic supply (CRWQCB-CVR, 2004). CDWR estimates groundwater use in the basin at 200 AFY and has assigned a very low-priority ranking to the basin as part of the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a). TDS concentrations in groundwater range from 394 to 3,530 mg/L with an average of 1,300 mg/L (CDWR, 2003).

The Panoche Valley basin does not contain any oil and gas fields with the existing Federal mineral estate.

Vallecitos Creek Valley (5-71). The Vallecitos Creek Valley basin encompasses 24 square miles in the Coast Ranges in eastern San Benito County (Figure 3.7-3). The basin is a northwest-southeast trending synclinal valley filled with alluvium and surrounded by nonmarine and marine sediments. Water bearing units may be limited to the shallow alluvium in the valley center. Three wells drilled in the northwest portion of the basin extend to depths of 80 to 122 feet. Groundwater flow is generally to the east toward Tulare Lake (CDWR, 2003).

The Basin Plan lists municipal and domestic supply as a beneficial use for groundwater in the Vallecitos Creek Valley basin (CRWQCB-CVR, 2004), although data from CDWR indicate only a relatively small amount of groundwater use in the basin (<500 AFY) (CDWR, 2014a). In addition, CDWR has assigned the basin a very low-priority ranking for the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The Vallecitos Creek Valley basin contains portions of one oil and gas field on BLM surface lands — the Vallecitos oil field. Figure 3.7-4 illustrates the regional geologic setting with a cross section across several areas of the Vallecitos field. As summarized on Table 3.7-3, the depth to fresh water beneath the Vallecitos field is reported to range from about 100 to 500 feet deep. The top of the hydrocarbon zone is reported to be as shallow as 80 feet, but that zone appears to be located in the hills outside of the groundwater basin boundary. Within the groundwater basin, the upper hydrocarbon zone is about 1,040 feet deep, providing a minimum vertical separation of about 540 feet to about 940 feet. Concentrations of sodium chloride in produced water are reported to range between about 1,100 mg/L to 3,600 mg/L. TDS concentrations in produced water are reported at 8,100 mg/L and 8,200 mg/L in two areas of the field. Depth and salinity data indicate that protected groundwater is in close proximity to hydrocarbon-bearing zones (see Appendix J in DOC, 2015; DOC, 1998).

Santa Cruz County

Santa Cruz Purisima Formation (3-21). The Santa Cruz Purisima Formation groundwater basin encompasses 63 square miles in central Santa Cruz County (Figure 3.7-2) and is defined by the Purisima Formation geologic boundary. The primary water bearing unit is the Purisima Formation, which is composed of moderately to poorly consolidated fine to medium-grained sandstone with interbeds of siltstone. The Purisima Formation is up to 2,000 feet thick and groundwater is primarily confined. Groundwater flows to the east in the northern portion of the basin and either to the southwest towards Monterey Bay or to the southeast towards Pajaro Valley in the remaining portions of the basin. Municipal/irrigation wells range from 61 to 833 feet deep and yield up to 200 gpm. Groundwater storage in the Purisima Formation, west of the Zayante Fault, is estimated to be 1.22 million AF. TDS concentrations range from approximately 300 to 600 mg/L (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the Santa Cruz Purisima Formation basin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR reports a groundwater use of about 15,000 AFY in the basin and has assigned a medium-priority ranking to the basin for the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The Santa Cruz Purisima Formation basin does not contain any oil and gas fields with the existing Federal mineral estate.

Pajaro Valley (3-2). The Pajaro Valley groundwater basin is 120 square miles and extends into Monterey and San Benito Counties (Figure 3.7-2). It is bounded by the Monterey Bay to the west, the San Andreas Fault to the east, the Purisima Formation to the north, and a drainage divide to the south. The Aromas Red Sands formation is the primary water-bearing unit in the basin and is composed of well sorted brown to red sands weakly cemented with iron oxide. The Aromas Red Sands formation ranges from 100 feet thick in the foothills to 900 feet near the mouth of the Pajaro River. Municipal/irrigation well depths range from 150 to 800 feet and yield between 100 and 2,000 gpm. Groundwater levels have decreased due to over pumping; between 34 and 51 square miles of the basin have groundwater levels below sea level. The total storage capacity of the basin is estimated to be approximately 7.7 million AF. TDS concentrations vary throughout the basin based on groundwater age. High TDS concentrations are found near the coast due to recent seawater intrusion and older seawater in the Purisima Formation has TDS concentrations that range from 3,000 to 30,000 mg/L (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the Pajaro Valley basin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR reports a groundwater use of approximately 67,000 AFY in the basin (CDWR, 2014a). CDWR has assigned the basin a high-priority ranking for the CASGEM basin prioritization program (CDWR, 2014a) and has also placed it on the List of Critically Overdrafted Groundwater Basins (Table 3.7-2) (CDWR, 2016).

The Pajaro Valley groundwater basin does not contain any oil and gas fields with the existing Federal mineral estate.

Leases Subject to Settlement Agreement

The 14 leases subject to the settlement agreement are located in Monterey and San Benito Counties, as shown in purple on Figures 3.7-1 and 3.7-3.

In Monterey County, most of the leases subject to the settlement agreement do not occur within a groundwater basin. For the most part, the leases are located in the hills of the Coast Ranges between the Lockwood Valley groundwater basin (3-6) to the west, and the Salinas Valley to the east (Upper Valley Aquifer subbasin 3-4.05 and the Paso Robles Area subbasin 3-4.06). However, a small portion of the southernmost lease (Lease CACA 052960 – approximately 20 acres) within Monterey County intersects

the edge of the Salinas Valley, Paso Robles Area subbasin (3-4.06). None of the leases in Monterey County are in existing oil and gas fields.

The leases subject to the settlement agreement in San Benito County are predominantly located around the periphery of the Vallecitos Creek Valley groundwater basin (5-71), which is described above. Approximately 400 acres of the leases (Leases CACA 053828, 053830, 053831, and 053835) are within the basin boundary. Several of the leases are within or overlap portions of the Vallecitos oil field (see geologic cross section across portions of the Vallecitos oil field on Figure 3.7-4).

3.7.5 Recent Well Stimulation Treatment Studies

Several significant studies on well stimulation treatments have been published recently, including studies by the California Council on Science and Technology (CCST, 2014 and CCST, 2015a,b, and c), the United States Geological Survey (Taylor et al., 2014), and the EPA (2016). These studies, along with other published scientific literature and information generated in compliance with recent legislation on well stimulation in California (SB 4), provide the framework for analyzing potential impacts to groundwater resources from well stimulation treatments. Key elements of these studies are summarized below. Potential impacts on groundwater resources from well stimulation treatments are analyzed in more detail in Section 4.7 of this EIS.

In August 2014, the California Council on Science and Technology (CCST) released a report on well stimulation entitled, "Advanced Well Stimulation Technologies in California, An Independent Review of Scientific and Technical Information." This report was commissioned in September 2013 to provide BLM with information to be used for "future planning, leasing, development decisions regarding oil and gas issues on the Federal mineral estate in California" (CCST, 2014). This report summarizes information available through February 2014, addressing hydraulic fracturing and well stimulation treatments in onshore oil reservoirs in California. The study also includes a section on Potential Direct Environmental Effects of Well Stimulation (Section 5), which includes an analysis of the potential impacts to water including groundwater (Section 5.1).

In December 2014, the USGS California Water Science Center completed a preliminary discussion paper entitled, "Oil, Gas, and Groundwater Quality in California — a discussion of issues relevant to monitoring the effects of well stimulation at regional scales" (Taylor et al., 2014). This study, prepared with the cooperation of the State Water Resources Control Board (SWRCB), is intended to provide the public, SWRCB, and experts convened by Lawrence Livermore National Laboratory (LLNL) with information on key policy issues, a potential scientific approach for regional groundwater monitoring, and potential strategies for implementation of groundwater monitoring criteria. This process was part of the development of groundwater monitoring criteria for well stimulation treatments in California as required by SB 4.

In December 2016, the EPA released a report entitled, "Hydraulic Fracturing for Oil and Gas: Impacts from the Hydraulic Fracturing Water Cycle on Drinking Water Resources in the United States." The study focuses on hydraulic fracturing data observed across the nation. However, EPA's findings on the potential impacts of well stimulation on a national level may be applicable to California and are reviewed for the impacts assessment provided in Section 4.7 of this EIS.

In 2015, CCST completed a study on well stimulation entitled, "An Independent Scientific Assessment of Well Stimulation in California." The report was prepared for the California Natural Resources Agency pursuant to SB 4 and was published in three volumes:

- Volume 1: Well Stimulation Technologies and their Past, Present, and Potential Future Use in California (January 2015)
- Volume II: Potential Environmental Impacts of Hydraulic Fracturing and Acid Stimulations (July 2015)

- Volume III: Case Studies of Hydraulic Fracturing and Acid Stimulations in Select Regions: Offshore, Monterey Formation, Los Angeles Basin, and San Joaquin Basin (July 2015)

Numerous additional publications from the scientific literature support the analysis of impacts to groundwater from hydraulic fracturing conducted herein (e.g., Carey et al., 2013; Chilingar and Endes, 2005; Horsley Witten Group, 2011; Howarth et al., 2012; Jackson et al., 2013; MRS, 2008). Because most of these papers were incorporated into the CCST analyses and support their conclusions, the additional papers are not cited or described separately.

3.8 Surface Water Resources

3.8.1 Introduction

This section describes baseline conditions for surface waters for the area covered by this RMPA/EIS. The baseline conditions described here focus on surface waters relevant to oil and gas well exploration and production, including relevant regulatory issues, the regional setting, and current conditions and trends. The regional setting summarizes the topography, climate and major watersheds of the area. Current conditions and trends describe floodplain conditions, water quality, and water use and supply.

3.8.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/EIS), refer to Appendix J.

3.8.3 Regional Setting

Topography and Climate. The BLM Central Coast Field Office (CCFO) Planning Area terrain consists primarily of low, rolling hills and moderately sized mountains rising to elevations generally not more than 5,000 feet above mean sea level, both intersected by long, narrow, flat valleys. Mild winters and cool summers prevail in the northern and western portions of the CCFO Planning Area, with warmer summers and cooler winters in the south and further inland. Rainfall is seasonal, nearly all occurring in winter. At King City, near the center of the Federal mineral estate lands, summer maximum temperatures average 84 to 87 degrees Fahrenheit, with winter minimums 34 to 37 degrees. Annual rainfall is 11.25 inches, with 85% occurring between November and March (WRCC, 2015).

Watersheds and Surface Waters. The CCFO Planning Area is covered by 19 HUC-8 (8-digit hydrologic unit code) watersheds in four hydrologic regions (San Francisco Bay, Central Coast, San Joaquin River, and Tulare Lake) as shown in Figure 3.8-1 and listed in Table 3.8-1. Most are in the Central California Coastal hydrologic region. These watersheds drain directly to the Pacific Ocean either at Monterey Bay (Estrella, Pajaro, Salinas, San Lorenzo–Soquel, and Alisal–Elkhorn Slough watersheds) or along the coast south of Monterey Bay (Carmel and Central Coast watersheds). With the exception of the San Francisco Coastal South watershed, which drains directly to the Pacific Ocean, all of the rest of the watersheds drain to the Pacific Ocean through San Francisco, San Pablo or Suisun Bays. Watersheds in the San Joaquin Hydrologic Region reach the San Francisco Bay by way of the San Joaquin River. The Tulare–Buena Vista Lakes hydrologic region is essentially a closed system, draining to the San Joaquin River only in extreme rainfall years (CDWR, 2013a).

Figure 3.8-2 shows the stream network and major rivers, which include the San Benito River, the Salinas River, and others. Major rivers are generally perennial through most of their length, carrying some flow at all seasons of the year, although summer and fall flows can be low due to lack of rainfall. For instance, the Salinas River at Soledad, in the vicinity of the Federal mineral estate within the CCFO Planning Area, averages a low of 121 cubic feet per second (cfs) in November and a high of 1,270 cfs in February (USGS, 2015a). The San Benito River in the vicinity of the main body of the Federal mineral estate approximately 40 miles upstream of Hollister averages 28 cfs in January and 0.8 cfs in September (USGS, 2015b).

Most of the streams shown in Figure 3.8-2 are small collector drainageways. The high map density of these streams is due to the hilly terrain, with a stream at the bottom of every small canyon. Due to the semi-arid climate (about 11 inches of rain per year), most of these minor streams are dry during much of the year carrying flow only in response to rainfall.

Table 3.8-1. Hydrologic Regions and Watersheds of the CCFO Planning Area

Hydrologic Region	Watershed
San Francisco Bay	San Francisco Coastal South
	San Francisco Bay
	San Pablo Bay
	Suisan Bay
	Coyote
San Joaquin	San Joaquin Delta
	Middle San Joaquin–Lower Merced–Lower Stanislaus
	Panoche–San Luis Reservoir
	Middle San Joaquin–Lower Chowchilla
Central California Coastal	Pajaro
	Salinas
	San Lorenzo–Soquel
	Alisal–Elkhorn Slough
	Carmel
	Central Coast
	Estrella
Tulare–Buena Vista Lakes	Tulare–Buena Vista Lakes
	Upper Los Gatos–Avenal

3.8.4 Current Conditions and Trends

Central Coast Field Office Planning Area

Floodplains. Figure 3.8-3 shows 100-year flood areas mapped by the Federal Emergency Management Agency (FEMA) (FEMA, 2015). Two floodplain zones are shown. The Zone A Approximate Area is delineated by approximate methods and could be substantially revised by detailed hydrologic and hydraulic analysis. The Detailed Study Area represents all of the other FEMA 100-year floodplain zones developed using detailed computations more accurate than the approximate methods.

The floodplains shown in Figure 3.8-3 represent only those floodplains that have been studied and approved by FEMA for inclusion on regulatory flood maps. Any watercourse carrying natural flow can produce a flood hazard and have a 100-year floodplain. FEMA has not mapped many watercourses, including most outside of urban areas, and these watercourses do not appear on these maps as hazard areas. Consequently, flood hazards, and related water quality contamination from flooded areas, could occur outside of the flood areas that are shown in Figure 3.8-3.

Surface Water Quality, Sediment and Erosion. The CCFO Planning Area is within the jurisdiction of the Central Coast (RWQCB Region 3), Central Valley (RWQCB Region 5) and San Francisco Bay (RWQCB Region 2) RWQCBs. The RWQCBs assess surface water quality throughout the State and prepare a list of waters (the Section 303(d) list of water quality limited segments) considered to be impaired. Impairment may result from both point-source and non-point source pollutants. Figure 3.8-4 shows the location of waters considered by the RWQCBs to be impaired. There are currently 67 water bodies identified as impaired within the Planning Area, many of which have approved TMDLs. Table 3.8.2 provides a list of impaired water bodies as per the SWRCB 2014/2016 Integrated Report on Water Quality. Specific impairments and TMDLs are listed in the 2014-2016 Statewide Integrated Report (SWRCB, 2018). In cases where a TMDL exists, any project that would have an effect on Waters of the State would, through the CWA Section 401 process, be evaluated in consideration of any load allocations in effect that may apply.

Table 3.8-2. Impaired Water Bodies within the CCFO Planning Area

RWQCB Region	Water Body	RWQCB Region	Water Body	RWQCB Region	Water Body
2	Almaden Lake	2	Oiger Quarry Ponds	3	Old Salinas River Estuary
2	Almaden Reservoir	2	Pilarcitos Lake	3	Pacific Ocean (Point Año Nuevo to Soquel Point)
2	Anderson Reservoir	2	Sacramento–San Joaquin Delta	3	Pajaro River Estuary
2	Briones Reservoir	2	San Francisco Bay, Central	3	Pinto Lake
2	Calaveras Reservoir	2	San Francisco Bay, Lower	3	Salinas River Lagoon (North)
2	Calero Reservoir	2	San Francisco Bay, South	3	Salinas River Refuge Lagoon (South)
2	Carquinez Strait	2	San Leandro Bay (part of SF Bay, Lower)	3	San Antonio Reservoir
2	Castro Cove, Richmond (San Pablo Basin)	2	San Pablo Bay	3	San Lorenzo River Lagoon
2	Central Basin, San Francisco (part of SF Bay, Lower)	2	San Pablo Reservoir	3	Santa Cruz Harbor
2	Coyote Reservoir	2	Shadow Cliffs Reservoir	3	Schwan Lake
2	Del Valle Reservoir	2	Stege Marsh	3	Soquel Lagoon
2	Guadalupe Reservoir	2	Stevens Creek Reservoir	3	Uvas Reservoir
2	Islais Creek	2	Suisun Bay	5	Delta Waterways (central portion)
2	Lafayette Reservoir	2	Upper San Leandro Reservoir	5	Delta Waterways (export area)
2	Lake Chabot (Alameda Co)	3	Chesbro Reservoir	5	Delta Waterways (southern portion)
2	Lake Merced	3	Corcoran Lagoon	5	Delta Waterways (western portion)
2	Lake Merritt	3	Elkhorn Slough	5	Discovery Bay
2	Lexington Reservoir	3	Espinosa Lake	5	Los Banos Reservoir
2	Lower Crystal Springs Reservoir	3	Hernandez Reservoir	5	Los Vaqueros Reservoir
2	Mission Creek	3	Monterey Harbor	5	Marsh Creek Reservoir
2	Oakland Inner Harbor	3	Moro Cojo Slough	5	O'Neill Forebay
	Oakland Inner Harbor (Fruitvale Site, part of SF Bay, Lower)	3	Moss Landing Harbor	5	San Luis Reservoir

The following is a brief watershed-specific overview of water quality issues from the 2013 California Water Plan (CDWR, 2013b; CDWR, 2013c):

- **San Francisco Bay Hydrologic Region Watersheds**. Surface water quality issues include pathogens, nutrients, sediments, and toxic residues from urban runoff. Some toxic residues are from past human activities such as mining; industrial production; and the manufacture, distribution, and use of agricultural pesticides. These residues include mercury, polychlorinated biphenyls (PCBs), selenium, and chlorinated pesticides.

  Emerging pollutants in the San Francisco Bay region include flame retardants, perfluorinated compounds, nonylphenol fipronil, and pharmaceuticals. Sanitary sewer spills can occur because of aging collection systems and treatment plants. San Francisco Bay and a number of the streams, lakes, and reservoirs in the San Francisco Bay Region have elevated mercury levels from local mercury mining and mining activities in the Sierra Nevada and coastal mountains. Wastewater treatment plants and urban runoff also are additional sources of mercury from non-mining sources, and some wetlands may contain significant amounts of methylmercury from contaminated sediments.

- **San Lorenzo River and Santa Cruz Area Watersheds**. Anthropogenic disturbances have accelerated the natural processes of erosion and sedimentation, resulting in declines in anadromous fisheries and the quality of fish habitat. Fecal coliform exceeds the basin plan criteria in many streams and sloughs.

- **Pajaro Watershed**. Water quality problems include erosion and sedimentation, pesticides, nutrients, heavy metals, pathogens, streambed flow alterations, endangered habitat, and riparian vegetation removal. Agriculture is the dominant land use in the watershed and grazing is common in the remote areas of the watershed such as along the upper San Benito River. Agricultural lands are the major source of nutrient and sediment loading into the Pajaro River. Low-density residential development, flood control projects, sand, gravel, and mercury mining, and off-road vehicle activity have contributed to accelerated erosion and sedimentation and have impacted steelhead habitat for migration and spawning. Fecal coliform levels in the Pajaro River and many of its tributaries exceed water quality objectives. Cyanobacteria cause harmful algal blooms in Pinto Lake near Watsonville.

- **Elkhorn Slough Watershed**. Water quality concerns include erosion, pesticides, bacteria, and scour. Agriculture and Moss Landing harbor activities, including ongoing dredging, are impacting the Slough.

- **Carmel River Watershed**. Currently no segments of the Carmel River are identified as impaired. Tularcitos Creek is impaired for chloride, fecal coliform and sodium.

- **Salinas River Watershed**. Agriculture is the dominant land use within the Salinas watershed, and some agricultural practices have degraded water resources. Surface waters are impacted by high levels of nitrate, as well as toxicity and pesticides. Impairments also include fecal coliform, nutrients, toxicity, and pesticides. Elevated nutrient concentrations have led to the degradation of municipal and domestic water supplies and have impaired most aquatic freshwater habitat beneficial uses for the lower Salinas River and its tributaries. The pesticides chlorpyrifos and diazinon are present in several areas at levels that do not protect aquatic-life beneficial uses, such as fish habitat, migration, spawning and development.

The Clean Water Act mandates development of total maximum daily loads (TMDLs) for water bodies listed as impaired. A TMDL is the limit on the amount of a pollutant that an individual water body can regularly assimilate and still maintain its beneficial uses. An EPA-approved TMDL establishes responsibility for controlling the pollutant and the implementation strategies to achieve the allowable amount of pollutant loading. Several TMDLs, for instance for nitrate in the San Lorenzo and Pajaro rivers and for sediment on the Pajaro and San Benito rivers, have been approved (CDWR, 2009).

Each RWQCB develops a basin plan summarizing the assessment of surface water quality, outlining steps to improve water quality, and designating beneficial uses of surface waters. California State waters are protected against water quality degradation in order to preserve beneficial uses.

Examples of beneficial uses relevant to the Federal mineral estate within the CCFO Planning Area include those listed in Table 3.8-3 (RWQCB, 2011).

Table 3.8-3. Example Beneficial Uses of Surface Waters

	Waterbody				
Beneficial Use*	Salinas River	San Lorenzo Creek	San Benito River	Arroyo Seco River	Tres Pinos Creek
MUN	X	X	X	X	X
AGR	X	X	X	X	X
IND	X		X	X	X
PRO	X				

Table 3.8-3. Example Beneficial Uses of Surface Waters

	Waterbody				
Beneficial Use*	Salinas River	San Lorenzo Creek	San Benito River	Arroyo Seco River	Tres Pinos Creek
GWR	X	X	X	X	X
REC1	X	X	X	X	X
REC2	X	X	X	X	X
WILD	X	X	X	X	X
COLD	X			X	
WARM	X	X	X	X	X
MIGR					
SPWN	X	X		X	
FRESH			X	X	
COMM	X	X	X	X	X

* Municipal and Domestic Supply (MUN); Agricultural Supply (AGR); Industrial Service Supply (IND); Industrial Process Supply (PRO); Ground Water Recharge (GWR); Water Contact Recreation (REC 1); Non-contact Water Recreation (REC 2); Wildlife Habitat (WILD); Cold Freshwater Habitat (COLD); Warm Freshwater Habitat (WARM); Freshwater Replenishment (FRSH); Spawning, Reproduction, and/or Early Development (SPWN); and, Commercial and Sport Fishing (COMM).

NOTE: This table provides examples only and is not intended to be a complete list of all waterbodies in the Planning Area.

Water Use and Supply. The San Francisco Bay Hydrologic Region depends heavily on surface water supplies, mostly imported from outside the region. Local streams are a significant water source in certain areas, especially in the South Bay, within the CCFO Planning Area. Groundwater provides only about 15 percent of supply. Water use is predominantly urban, of which approximately 50 percent is residential. Agricultural use is minor, amounting to about 1 percent of the total (CDWR, 2013c).

Water supplies in the San Joaquin Hydrologic Region consist of groundwater and surface water supplies. Surface water is mostly imported by the Central Valley Project or State Water Project or derived from local sources. Rivers on the east side of the Central Valley, outside the CCFO Planning Area, provide most of the local sources. Agriculture is the largest user of water in this region, with urban use only a small portion of the total (CDWR, 2013d). The Tulare–Buena Vista Lakes Hydrologic Region has a similar pattern of supply and use, with substantial reliance on rivers on the eastern side of the Central valley (CDWR, 2013a).

The Central Coast Hydrologic Region within the CCFO Planning Area relies on local surface water, imported water and groundwater. The San Lorenzo River supplies the City of Santa Cruz. The Carmel River is an important source of supply for the Monterey area. Imported surface water from the Central Valley Project supplies other portions of this region within the Administrative Area. Overall, agriculture is the largest consumer of water within this hydrologic region (CDWR, 2013b).

The CCFO Planning Area includes surface reservoirs and aqueducts (Figure 3.8-1), some of which are downstream of Federal mineral estate lands. The San Luis Reservoir, on the east side of the Administrative Area and downstream of estate lands, is a storage reservoir for the State Water Project and Central Valley Project. The State Water Project and the Central Valley Project also have major aqueducts and storage facilities running along the eastern boundary of the CCFO Planning Area. Hernandez Reservoir, on the San Benito River, in an area of the mineral estate lands, is used for flood control and groundwater recharge (Todd, 2011).

Water supplies within the State of California have been severely constrained in recent years due to recurring drought cycles. During 2015, the Planning Area was in a severe to exceptional drought status (NDMC, 2015), and there were mandatory water restrictions statewide.

Aquatic Intactness. Aquatic intactness utilizes a common conservation planning approach of subwatershed-scale (HUC12) data summary and scoring, synthesizing and interpreting spatial data for 43 metrics consolidated into 22 indicators within the categories of surface water quality and quantity, sedimentation and erosion, surrounding surface management practices, habitat connectivity, and water temperature (BLM, 2018). The Aquatic Species Status group of indicators summarizes the findings of a recent database for aquatic-dependent species, including all BLM Special Status Species that use freshwater habitats. The Aquatic Habitats Status indicators provide multiple summaries of a multi-source aquatic feature and land cover dataset. A group of Habitat Integrity indicators includes assessment of watershed condition, temperature conditions, habitat connectivity, water quality, water quantity, and land stewardship factors. Future threats are anticipated within indicators related to land conversion, resource extraction, climate change, water quality risk, and introduced species. The combined results map the pattern of relative condition of aquatic species, habitats, condition, and threats across a broad landscape. HUC12 subwatersheds with the highest aquatic intactness score are indicated on Figure 3.8-1 and include the Robinson Creek–South Fork Orestimba Creek, Red Creek–South Fork Orestimba Creek, Upper North Fork Pacheco Creek, Willow Creek, Salmon Creek–Frontal Pacific Ocean, and Upper Cantua Creek.

Leases Subject to Settlement Agreement

The leases subject to the Settlement Agreement are primarily within the Salinas Watershed (southern lease grouping near Lockwood; Leases CACA 053824, 053825, 053826, 053827, 052959, and 052960) or the Panoche–San Luis Reservoir Watershed (northern lease grouping, Leases CACA 053828, 053829, 053830, 053831, 053832, 053833, 053834 and 053835). The southern lease group is located in the hills between the San Antonio River (a tributary to the Salinas River) and the Salinas River. Runoff from these lease lands drains to the San Antonio River and the Salinas River. Drainage that reaches the San Antonio River passes through Lake San Antonio, operated by the Monterey County Water Resources Agency for flood protection and water conservation. Most of the runoff from the northern grouping drains to the Central Valley via Panoche Creek. A small portion (roughly 1,800 acres of Leases CACA 053834 and 053833) of the northern group is within the Upper Los Gatos–Avenal Watershed, and a smaller portion (roughly 60 acres of Lease CACA 053831) is within the Pajaro Watershed.

All of the lease lands are in hilly terrain. Local watercourses are numerous but consist of small watersheds that are dry due to the semi-arid climate except following periods of rainfall. None of the lease lands is in designated floodplains. Undesignated flood zones within the lease lands would be narrow and confined to the local canyon bottoms due to steep terrain and relatively low discharges from the small catchments.

Although there are no impaired waters within the area of the leases, all of the major receiving waters downstream of the lease areas are impaired. The San Antonio Reservoir is impaired for mercury. The San Antonio River is impaired for E. coli and fecal coliform. The Salinas River is impaired for *E. coli*, fecal coliform, pesticides, pH, temperature, turbidity, and unknown toxicity. A portion of Panoche Creek is impaired for mercury, sediment toxicity, sedimentation, and selenium.

Beneficial uses of the Salinas River are described above. Beneficial uses of the San Antonio River, San Antonio Reservoir, and Panoche Creek, are as listed in Table 3.8-4 (RWQCB, 1998, RWQCB, 2011):

Table 3.8-4. Beneficial Uses of Surface Waters for Leases Subject to the Settlement Agreement

	Waterbody		
Beneficial Use*	San Antonio River	San Antonio Reservoir	Panoche Creek
MUN	X	X	
AGR	X	X	X
IND	X		X

Table 3.8-4. Beneficial Uses of Surface Waters for Leases Subject to the Settlement Agreement

	Waterbody		
Beneficial Use*	**San Antonio River**	**San Antonio Reservoir**	**Panoche Creek**
PRO			X
GWR	X	X	X
REC1	X	X	X
REC2	X	X	X
WILD	X	X	X
COLD	X	X	
WARM	X	X	X
MIGR	X		
NAV		X	
SPWN	X	X	
FRESH	X	X	
RARE	X	X	X
COMM	X	X	

* Municipal and Domestic Supply (MUN); Agricultural Supply (AGR); Industrial Service Supply (IND); Industrial Process Supply (PRO); Ground Water Recharge (GWR); Water Contact Recreation (REC 1); Non-contact Water Recreation (REC 2); Wildlife Habitat (WILD); Cold Freshwater Habitat (COLD); Warm Freshwater Habitat (WARM); Freshwater Replenishment (FRSH); Spawning, Reproduction, and/or Early Development (SPWN); Navigation (NAV); Preservation of Rare and Endangered Species (RARE); and, Commercial and Sport Fishing (COMM).

3.9 Soil Resources

3.9.1 Introduction

Soil resources provide the foundation for vegetation and biological communities and safeguard water and air quality. Terrestrial and aquatic systems depend on the presence of suitable quality soils for their function. Soil quality is based on soil attributes, such as water holding capacity, texture, erosion potential, and slope.

Best Management Practices (BMPs, see Appendix D) for soils are applied to BLM actions and authorizations to limit compaction and reduce the potential for accelerated erosion through minimizing surface disturbance and reclaiming disturbed sites.

3.9.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/Final EIS), refer to Appendix J.

3.9.3 Regional Setting

Soil Types and Land Form

The CCFO Planning Area is within the southern Coast Ranges geomorphic province (CGS, 2002), which is characterized by summit elevations generally in the range of 2,000 to 4,000 feet (610 to 1,220 meters). Topography is generally not precipitous and rounded summits predominate; however, there are areas of steep slopes and incised canyons. The northwest trending ranges are subparallel to the San Andreas fault and are the result of extensive folding and faulting. The current landscape is a result of mountain-building episodes that began in the late Miocene and continued into the mid-Pleistocene. The majority of the Coast Ranges contains sedimentary deposits of both marine and terrestrial origin underlain by the basement rock of either the Franciscan Complex or granitic rocks of the Salinian Block. The Franciscan terrane occurs east of the San Andreas fault, and the Salinian Block to the west. The Franciscan Complex is an Early Cretaceous accretionary assortment containing blocks of greywacke, greenstone, blueschist, and serpentinized ophiolite (Oze, 2003).

The eastern edge of the San Joaquin Management Area extends into the Great Valley geomorphic physiographic province. The province is characterized by a great thickness of Jurassic age or younger marine and terrestrial sedimentary deposits. The San Joaquin Valley is known for very rich agriculture soils and large producing oil fields.

Erosion Prone Soils

Several factors affect the potential for soil erosion, including climate (precipitation and wind exposure, vegetation, slope, the physical characteristics of soil (soil texture). Sandy textured soils are the most prone to soil erosion due to lack of particle cohesion. Silt and clay-textured soils contain small particle sizes that are more cohesive and less susceptible to erosion by water and wind. Gravel and coarse sand are not very cohesive but contain larger particles that are less susceptible to erosion by water and wind due to large particle size and weight.

The most erosive soils are sandy loam soils (low cohesion and reduced infiltration rate) that occur on steep slopes with sparse vegetation and high average annual rainfall. Based on a review of RUSLE K-factor values (a measurement of soil erosivity from precipitation and overland flow), erosive soils can be found throughout the CCFO Planning Area. The largest concentration of highly erosive soils is found in the Call Mountains and the southern portion of the Diablo and Gabilan Ranges, south of Hollister, east of Pinnacles National Monument, north of California Highway 198, and west of the Panoche, Griswold, and Ciervo Hills (SWRCB, 2011). Prior to any oil and gas production activities, developers conventionally undertake a site-

specific geologic and geotechnical analysis to identify erosion hazards and potentially erosive soils. BMPs for erosion and sediment control would be applied in erosion-prone areas.

Naturally-Occurring Hazardous Minerals

Some soils within the CCFO Planning Area include naturally occurring hazardous materials, such as chrysotile asbestos, nickel, chromium, mercury, and other heavy metals found in soils derived from serpentine (BLM, 2013). These naturally occurring hazardous minerals may be eroded and transported great distances as alluvium in streams and rivers (BLM, 2013) or transported as airborne particulate matter.

Valley Fever

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. The distribution of valley fever in soils is poorly known (BLM, 2012a). Portions of the CCFO Planning Area are known or suspected endemic areas for valley fever, including areas with active oil and gas fields (CDC, 2013). *C. immitis* grows in the upper 5-20 cm of the soil in endemic areas and upon maturity can be released into the air as spores during surface disturbing actions, including wind storms. Some key factors that influence the growth of *C. immitis* include temperature, the amount and timing of rainfall and available moisture (humidity), soil texture, alkalinity, salinity, and the degree of exposure to sunlight and ultraviolet light (BLM, 2012a). The risk of infection as a result of inhalation can be reduced by implementing dust control measures and by avoidance soil disturbance.

3.9.4 Current Conditions and Trends

Central Coast Field Office Planning Area

The key soil related issues in the CCFO Planning Area caused by oil and gas leasing and development are soil compaction and soil erosion. Ground disturbance during grading of access roads, drill pads, and oil field facilities could result in soil erosion. Soil compaction due to routine use and vehicle traffic will occur along access roads and staging areas. To a lesser extent, soil compaction may occur where geophysical surveys travel on otherwise undisturbed soil areas. Loose soil from grading and other ground disturbance, as well as compacted soils that reduce infiltration and increase runoff, can both be susceptible to increased erosion. Soil loss is usually a loss of fertility and thwarts vegetation growth in areas designated for revegetation.

Central Coast Management Area

Soils in the Central Coast Management Area are generally less susceptible to erosion than the soils in other areas of the CCFO Planning Area. However, the Santa Cruz Mountains northeast of the City of Santa Cruz contain soils that are more highly susceptible to erosion due to their predominantly sandy texture, steep slopes, and high average annual rainfall (SWRCB, 2011). The Central Coast Management Area is dominated by well-developed Mollisols, which have a dark-colored surface horizon that is relatively rich in organic matter (NRCS, 2015). Mollisols tend to be base-rich throughout their horizon profile and are quite fertile. The northern portion of this management area includes a substantial amount of Inceptisols, which occur in semiarid to humid environments and generally exhibit only a moderate amount of weathering and soil development (NRCS, 2015). The southern portion of this management area includes a substantial amount of Entisols, which exhibit little to no soil horizon development and which occur in areas of recently deposited parent materials or in areas where erosion and deposition rates are faster than soil development rates, such as sand dunes, steep slopes, or floodplains (NRCS, 2015).

San Joaquin Management Area

The San Joaquin Management Area covers a large area with diverse geology and soils. This management area contains large areas of soils that are highly susceptible to erosion, including the hills east of San Francisco Bay, the hills surrounding San Luis Reservoir, many areas throughout the Diablo Range, Panoche Valley and the hills west of Panoche Valley, and Pleasant Valley in the southern portion of the management area (SWRCB, 2011). No single soil order dominates this management area. The northern portion of this management area contains Mollisols, Inceptisols, and Entisols (NRCS, 2015). The northern portion also contains substantial amounts of Alfisols and Vertisols (NRCS, 2015). Alfisols occur in semiarid to moist areas and form primarily under forest or mixed vegetative cover. Weathering processes for this soil order leach clay minerals and other constituents out of the surface layer and into the subsoil, which then can hold much moisture. Vertisols contain a high percentage of expansive smectite clay that tend to shrink and swell with changes in soil moisture content.

The southern portion of this management area contains substantial amounts of Alfisols, Entisols, Inceptisols, and Mollisols (NRCS, 2015). In addition, the southeastern portion of this management area contains a substantial amount of Aridisols, which are too dry for the growth of plants requiring moderate amounts of water (NRCS, 2015). The low moisture content restricts the amount of weathering, and most soil development is limited to the upper parts of the soils. Aridisols often accumulate gypsum, salt, calcium carbonate, and other materials that would otherwise be leached from soils in more humid environments. Soils in the southern portion of this management area, including those found within the Clear Creek Serpentine ACEC and those within the Big Blue Hills, contain naturally-occurring chrysotile asbestos, which can pose a hazard to human health if mobilized and inhaled (BLM, 2013).

San Benito Management Area

Of the four management areas within the CCFO Planning Area, this management area contains the largest percentage of soils that are highly susceptible to erosion. These soils are found primarily within the mountains and foothills of the Diablo Range (SWRCB, 2011). Roughly half of this management area is underlain by soils that are highly susceptible to erosion (SWRCB, 2011). Mollisols are the dominant soil order in this management area, but this area also contains substantial amounts of Alfisols, Entisols, and Vertisols (NRCS, 2015). Soils in the southern portion of this management area, including those found within the Clear Creek Serpentine ACEC, contain naturally occurring chrysotile asbestos, which can pose a hazard to human health if mobilized and inhaled (BLM, 2013).

Salinas Management Area

Soils within this management area are generally less susceptible to erosion than the soils found in both the San Joaquin and San Benito Management Areas, and are roughly comparable to the erosion susceptibility of the soils found within the Central Coast Management Area (SWRCB, 2011). Soils in this management area with a higher susceptibility to erosion are found in the southern portion of this area and are associated with the steeper slopes of the Santa Lucia Range and the Cholame Hills (SWRCB, 2011). Mollisols are the dominant soil order in this management area (NRCS, 2015). This area also contains a substantial amount of Entisols, and smaller amounts of Alfisols, Inceptisols, and Vertisols (NRCS, 2015).

Leases Subject to Settlement Agreement

Soils of Leases CACA 052960, 052959, 053824, 053825, 053826, 053827 in Monterey County are largely derived from Pliocene (2 – 5 MYA) and Miocene-aged (5 – 23 MYA) marine sedimentary rocks including sandstone, shale, and conglomerate (BLM, 2011). Slopes range from 0 – 75% with the majority of the area of most leases being on steeper slopes (15 – 75%). Soil textural class of most soil types within the leases ranges from clay loam to silty clay loam, resulting in slow to moderate permeability (infiltration rate). The combination of relatively slow permeability and steep slopes results in medium to very rapid surface runoff,

garnering an erosion hazard rating of high to very high for large areas of the leases. Erosion hazard is a relative rating of the susceptibility of a soil type to erosion (BLM, 2011).

Soils of Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828 in San Benito County are derived from Cretaceous, Eocene, Miocene, and Pliocene-aged marine sedimentary rocks including sandstone, shale, siltstone, and conglomerate (BLM, 2012b). Slopes range from 0 – 75% with the majority of the area of most leases being on steeper slopes (15 – 75%). Soil textural class of most soil types within the leases ranges from clay loam to sandy loam, resulting in slow to moderate permeability. The combination of relatively slow permeability and steep slopes results in medium to very rapid surface runoff, resulting in an erosion hazard rating of very high to very severe for large areas of the leases (BLM, 2012b).

3.10 Biological Resources – Vegetation

3.10.1 Introduction

The Planning Area consists of structurally and compositionally diverse plant communities that range from desert scrublands in arid climates of the inland San Joaquin Desert (Valley) to mixed conifer forests in the coastal Santa Cruz Mountains. Diverse combinations of climate, soils, and topography support an equally diverse mosaic of plant species assemblages. As a result, the Planning Area hosts a number of unique plant communities and rare species. Examples of unique plant assemblages include:

- *Amsinckia furcata* and *Eriogonum nudum var. indictum* stands on the acidic, selenium-rich Moreno shale formation (eastern Panoche hills south to Coalinga);
- *Quercus x alvordiana* woodland patches in extremely arid locations on the acidic, gypsum-rich, selenium-rich Moreno shale (Cantua Creek drainage);
- *Lepidium jaredii ssp. album*, *Madia radiata*, *Deinandra halliana*, *Benitoa occidentalis*, *Monolopia major*, *Convolvulus simulans*, and *California macrophylla* on gypsum-rich, vertic clay soils derived from the Moreno shale and Temblor shale formations;
- *Ephedra*-topped sand dunes on Monocline Ridge supporting Mojave disjunct species including *Abronia pogonantha*, *Oenothera deltoides*, and *Stipa hymenoides*; and
- Mixed conifer forest consisting of *Pinus jeffreyi*, *P. coulteri*, *P. sabiniana*, and *Calocedrus decurrens* on serpentinite on San Benito Mountain.
- Vernal pools with downingia (*Downingia* sp.), meadowfoam (*Limnanthes* sp.), and other vernal pool annual plants.

Examples of rare species are local serpentine-endemic herbaceous plant species, including *Camissonia benitensis*, *Layia discoidea*, *Solidago guiradonis*, *Fritillaria viridea*, *F. falcata*, *Trichostema rubisepalum*, and *Monardella antonina ssp. benitensis*.

Ecological Site Inventories (ESIs) provide the basic inventory of present and potential vegetation on BLM land (Habich, 2001). The BLM monitors lands and vegetation to determine compliance with the Rangeland Health Standards and Guidelines (see Regulatory Framework, below). Corrective measurements are taken through appropriate management actions in areas where noncompliance with one or more of the standards is determined.

Project implementation plans, such as oil and gas extraction plans, provide for the protection, maintenance, and restoration of plant communities. The Central Coast Field Office (CCFO) requires that areas disturbed by oil and gas extraction are reclaimed to the extent possible.

The Planning Area is divided into four large geographic regions referred to as Management Areas: Central Coast, Salinas, San Benito, and San Joaquin. BLM land and split-estate comprises only a portion of each Management Area. Within Management Areas, there may be smaller units designated as Special Management Areas (SMAs). SMAs are lands that are set aside for protection of important historic, cultural, biological, and natural resource features or restricted for human safety, see Section 3.14, Special Management Areas. SMAs include Areas of Critical Environmental Concern (ACEC) and Wilderness Study Areas (WSAs), as well as other designations. Within SMAs, focused management protects and enhances resource values and minimizes detrimental impacts.

The Proposed Resource Management Plan Final Environmental Impact Statement (RMP FEIS; BLM, 2006) describes the major vegetation communities found within the CCFO Planning Area. Unless otherwise indicated, the information below is summarized from the RMP FEIS and has been updated as needed.

3.10.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/Final EIS), refer to Appendix J.

3.10.3 Regional Setting

The CCFO Planning Area encompasses approximately 793,000 acres of public and private lands with Federal ownership of subsurface minerals. Varied landforms include the Central Coast Range, the Salinas and San Joaquin Valleys, and three major watersheds that include the Pajaro River, which drains into the Pacific Ocean, and the Arroyo Pasajero and Silver Creek, which drain east to the San Joaquin Valley. Lands in the Planning Area range in elevation from nearly sea level to over 5,000 feet. The climate is Mediterranean, characterized by hot, dry summers and cool, wet winters. Annual precipitation occurs primarily as winter rain and ranges from 7 inches in the San Joaquin Desert at the western edge of the San Joaquin Valley to approximately 40 inches in the Santa Cruz Mountains at Cotoni-Coast Dairies. Due to the high diversity of climate, geology, and topography, the vegetation types across the Planning Area are likewise very diverse, ranging from desert scrub in the driest climates of the San Joaquin Valley (Desert), through coastal scrub, mixed chaparral, and oak woodland in semi-arid climates, to mixed conifer forest in more mesic climates at high elevations (San Benito Mountain) and in the coastal mountains (Santa Cruz Mtns; Sawyer et al. 1995). Valleys and low, rolling hills tend to be dominated by annual grasslands and forblands with sparse woodlands, while steeper slopes and mountains tend to be dominated by dense, woody vegetation types including scrub, chaparral, woodland, and forest. The annual grasslands are typically dominated by non-native species. The region falls into three climatic zones identified in The Jepson eFlora (2018): The San Joaquin Valley, the Inner South Coast Range, and the Outer South Coast Range. Major vegetation types of each geographic are identified and described in The Manual of California Vegetation (Sawyer et al., 1995); these descriptions are briefly summarized below.

SAN JOAQUIN VALLEY (DESERT)

The climate of the San Joaquin Valley is arid with average annual rainfall of 7 to 10 inches. Portions of the San Joaquin Valley are classified as arid, low altitude hot desert (BWh); arid mid-latitude warm desert (BWk); and semi-arid steppe (BSk) under the Köppen climate system (Germano et al. 2011). Based on its arid climate and desert flora and fauna that it harbors, the San Joaquin Valley is now formally ecologically recognized as the San Joaquin Desert (Germano et al. 2011). Vegetation of the San Joaquin Desert is dominated by numerous annual plant species and drought-tolerant desert shrubs. The desert annual plant species escape long periods of prolonged drought as dormant seeds in the soil seed bank. Major vegetation types of the San Joaquin Desert include:

Desert Annual Grassland/Forbland. Herbaceous vegetation of the western San Joaquin Valley is largely dominated by non-native annual grasses, especially red brome. Native annual forbs have relatively low abundance, but may become seasonally abundant and visually dominant, especially during above average rainfall years (superblooms). Vegetation is generally sparse during dry years or dry seasons.

- Red brome or Mediterranean grass grasslands.
- California goldfields - dwarf plantain - small fescue flower fields.
- California poppy - lupine fields.
- Monolopia - leafy-stemmed tickseed fields.

Desert Scrub. Several types of arid shrublands are found on the lower foothills and valley floors. These are generally characterized by drought tolerant shrubs and subshrubs.

- Allscale scrub
- California match weed patches.
- California joint fir - longleaf joint-fir scrub.
- Narrowleaf goldenbush - bladderpod scrub

Desert Riparian Zone. Limited to seasonal or perennial streams and adjacent alluvial stream terraces dominated by native trees and shrubs, or by dense stands of non-native tamarisk.

- Fremont cottonwood forest
- Tamarisk thickets

INNER SOUTH COAST RANGE

The semi-arid Inner South Coast Range is located between the arid San Joaquin Valley (Desert) and the mesic Outer South Coast Range. Average annual precipitation is 10 to 20 inches. The vegetation includes substantially higher cover of herbaceous perennial species and woody shrubs and trees. Major vegetation types of the Inner South Coast Range include:

Inner Annual Grassland/Forbland. Herbaceous vegetation, mostly dominated by native or non-native annual plant species, with high cover of native perennial grasses and forbs in some areas. Generally higher total cover than the San Joaquin Desert (see Desert Annual Grassland/Forbland above), Inner Annual Grassland/Forbland forms a substantial component of the understory of Inner Woodland. In years of favorable rainfall, total vegetative cover may be high and persist as residual dry matter (RDM; thatch) through the summers.

- California goldfields - dwarf plantain - small fescue flower fields
- California poppy - lupine fields
- Popcorn flower fields
- Foothill needle grass grassland
- Purple needle grass grassland
- Wild oats grasslands
- Annual brome grasslands
- Red brome or Mediterranean grass grasslands
- Yellow star-thistle fields

Inner Coastal Scrub. Soft scrub with scattered chaparral shrubs (see Inner Mixed Chaparral, below) or trees (see Inner Woodland, below) typically occurring on the driest slopes.

- California sagebrush scrub
- California sagebrush - California buckwheat scrub
- California sagebrush - black sage scrub
- California buckwheat scrub
- Black sage scrub

Inner Mixed Chaparral. Dense evergreen shrublands, often with scattered trees or with relatively open patches of herbaceous or coastal scrub species. Common and characteristic of Mediterranean climate zones in California typically occurring on steeper, drier slopes in uplands. Chamise chaparral

- Chamise - black sage chaparral
- Bigberry manzanita chaparral
- Wedge leaf ceanothus chaparral, Buck brush chaparral
- Leather oak chaparral (*on serpentine only*)
- Tucker oak chaparral
- Poison oak scrub

Inner Woodland. Several different woodland types, dominated by deciduous hardwoods such as valley oak or buckeye, evergreen hardwoods such as coast live oak, or by conifers such as foothill pines and California juniper typically occurring on less steep, more mesic slopes in uplands and also in valleys.

- California buckeye groves
- California juniper woodland
- Foothill pine woodland
- Blue oak woodland
- Coast live oak woodland
- Mixed oak forest
- Valley oak woodland

Inner Mixed Conifer Forest. Montane forest and woodland vegetation, dominated by Jeffrey pines at the higher elevations or by Coulter pines in chaparral transitions. Occurring in the highest elevations (most mesic) of the Inner South Coast Range – Mount Hamilton, Fremont Peak, San Benito Mountain.

- Coulter pine woodland
- Jeffrey pine forest

Inner Riparian Zone. Wetlands and streamside vegetation, found in canyon bottoms and on alluvial stream terraces. These vegetation types are generally found in linear patterns along watercourses.

- Cattail marshes
- Mulefat thickets
- California rose briar patches
- California sycamore woodlands
- Sandbar willow thickets
- Arroyo willow thickets
- Tamarisk thickets

OUTER SOUTH COAST RANGE

The Outer South Coast Range is located along the Pacific Coast. It is much more mesic than the Inner South Coast Range and San Joaquin Valley (Desert). Additionally, it has a strong maritime climate due to its close proximity to the coast. Average annual rainfall is 20 to 40 inches. Major vegetation types of the Outer South Coast Range include:

Outer Annual Grassland/Forbland. Similar to Inner Annual Grassland/Forbland, although generally more productive. Outer Annual Grassland/Forbland forms a substantial component of the understory of Outer Woodland.

- California poppy - lupine fields
- Purple needle grass grassland
- Wild oats grasslands
- Perennial rye grass fields
- Upland mustards
- Poison hemlock or fennel patches

Outer Coastal Scrub. Similar to Inner Coastal Scrub. . Characteristic of the lower foothill elevations.

- California sagebrush scrub
- California buckwheat scrub
- Coyote brush scrub
- Poison oak scrub
- Bush monkeyflower scrub
- Hazelnut scrub

Outer Mixed Chaparral. Similar in structure to chaparral of Inner Mixed Chaparral.

- Chamise chaparral
- Poison oak scrub

Outer Woodland. Deciduous and evergreen hardwood woodlands, often with closed canopy or intergrading with chaparral. Generally taller or denser stands than Inner Woodland and includes several types characteristic of mesic situations (e.g., madrone, tanoak, and California bay).

- California buckeye groves
- Coast live oak woodland
- Mixed oak forest
- Madrone forest
- Tanoak forest
- California bay forest

Outer Mixed Conifer Forest. Found in canyon bottoms or north slopes at the lower elevations (e.g., redwood forest), to montane sites throughout the ranges.

- Knobcone pine forest
- Douglas fir forest
- Douglas fir - tanoak forest
- Redwood forest

Outer Riparian Zone. Wetlands and linear streamside vegetation, found in canyon bottoms and on alluvial stream terraces. Generally in linear patterns along watercourses.

- Baltic and Mexican rush marshes
- Iris-leaf rush seeps
- Cattail marshes
- California bulrush marsh
- Arroyo willow thickets

3.10.4 Current Conditions and Trends

Central Coast Field Office Planning Area

BLM land within the Planning Area supports a variety of vegetation communities that can be grouped by the three region climates – San Joaquin Desert, Inner South Coast Range, and Outer South Coast Range, identified and described above.

Jurisdictional Waters

For the purposes of environmental review, wetlands are addressed both as habitat and as waters of the U.S. or waters of the State under the jurisdiction of the USACE, the State Water Resources Control Board (SWRCB), and the CDFW. Wetlands are characterized by (1) permanent or periodical saturation or inundation, (2) specific "hydric" soil conditions resulting from saturation, and (3) vegetation adapted to saturated soil conditions. In addition to wetlands, many streambeds, lakebeds, or other hydrologic features may meet jurisdictional criteria based on presence of bed and bank, or ordinary high water mark. Jurisdictional waters may be found throughout the Planning Area. These waters and wetlands often provide important habitat for plants, fish, and wildlife.

Noxious and Invasive Weeds

Noxious and invasive weeds are an increasing problem on BLM lands throughout the west. Over 180 weed species have been identified in the Planning Area (CCH, 2015; Cal-IPC, 2015). Of particular concern on BLM lands in the Planning Area are tamarisk (*Tamarix* spp.), Russian thistle (*Salsola* spp.), and yellow starthistle (*Centaurea solstitialis*) in the San Joaquin Management Area; iceplant (*Carpobrotus* spp.), pampasgrass (*Cortaderia* spp.), French broom (*Genista monspessulana*), and German ivy (*Delairea odorata*) in the Central Coast Management Area; yellow starthistle and tocalote (*Centaurea melitensis*) in the San Benito Management Area; and yellow starthistle in the Salinas Management Area.

Non-native invasive plants that become established in a new area may displace native species (including special status species or plants that provide food or cover for wildlife), alter natural habitat structure, and increase wildfire frequency (Zouhar et al., 2008, pg. 34; Lovich and Bainbridge, 1999, pg. 313). Some weeds are poisonous or cause physical injury to wildlife, livestock, and people. These plants are considered "weeds" or "pest plants" in natural landscapes (Bossard et al., 2000). Invasive weeds generally spread most readily in disturbed, graded, or cultivated soils, including soils disturbed by construction equipment. Weeds and pest plants are not limited to "noxious weeds" as defined by the USDA, but are defined here to include any species of non-native plants identified on the weed lists of the California Department of Food and Agriculture, the California Invasive Plant Council, or of special concern identified by BLM.

Management Areas

A brief description of each of the four Management Areas within the Planning Area, including major vegetation communities, is provided below. Table 3.10-1 provides the area occupied by each major vegetation type within the Management Areas.

Central Coast Management Area

There are two areas of BLM-administered lands within the Central Coast Management Area — Coast Dairies and the Fort Ord National Monument. Neither of these areas is available for oil and gas development; the following is presented for informational purposes only.

Vegetation communities within the Coast Dairies include those described for Outer South Coast Range The Coast Dairies supports high-quality wildlife habitat in those areas that have not been directly affected by agricultural practices or development. The Coast Dairies is managed by BLM, in conjunction with the California Department of Parks and Recreation (CDPR), as outlined in the Long-term Resource Protection and Access Plan (ESA, 2003).

Vegetation communities on Fort Ord National Monument include those described for Outer South Coast Range, as well as coastal strand and dune, and vernal pools (USACE, 1997; Shaw, 2007). Fort Ord is a former military base, closed in 1994, and the BLM manages Fort Ord as described in a Habitat Management Plan (HMP; USACE, 1997). The Fort Ord Reuse Authority (FORA), a non-profit local government agency, also participates in management of the area. FORA has developed a draft Habitat Conservation Plan (HCP) that, if approved, would replace the management direction in the HMP (FORA, 2015).

Salinas Management Area

This Management Area includes steep rugged terrain in the Sierra de Salinas Range, which parallels the Santa Lucia Range to the west. The Salinas Management Area includes vegetation types described for Inner South Coast Range and Outer South Coast Range. The western portion of the Management Area lies in a zone of coastal influence, and fog often blankets all but the upper elevations during the spring and summer months. There are numerous intermittent drainages, and permanent water sources include the Arroyo Seco, Carmel, and Salinas Rivers. Another permanent water source is the San Antonio River, a perennial tributary to the Salinas River that is dammed to form the San Antonio Reservoir.

San Benito Management Area

The predominant feature in this Management Area is the Diablo Range, with its rugged, steep topography. Serpentine outcrops are common throughout this area. The San Benito Management Area includes vegetation types described for Inner South Coast Range. San Benito River originates near San Benito Mountain, flows northwest through the San Benito Management Area, and out to Monterey Bay.

San Joaquin Management Area

The San Joaquin Management Area lies partially within the San Francisco Bay Area, Inner South Coast Range, and western San Joaquin Valley. The San Joaquin Management Area includes vegetation types described for the Inner South Coast Range and San Joaquin Valley (Desert).

The USFWS has prepared the Recovery Plan for Upland Species of the San Joaquin Valley (USFWS, 1998) that addresses 34 special status plant and animal species that occur in this area. A number of these species occur on BLM lands. This Management Area includes several management units with areas designated for special status species. These management units are the Panoche Hills, Griswold-Tumey Hills, Ciervo Hills/Joaquin Rocks, and Coalinga. These areas are further discussed in Section 3.12 (Special Status Species) of this document.

Leases Subject to Settlement Agreement

Below is a brief description of the setting of each of the 14 non-NSO leases, as identified in Hollister I and Hollister II. The leases are described in Sections 2.6 through 2.10 for each alternative and are shown on Figures 2-1 through 2-6. Descriptions include major vegetation communities, but may not include all vegetation types and habitats present on the site. When and if BLM receives an application for permission to drill a well on the lease, site specific surveys or review to assess conditions of vegetation would be completed during review and approval of individual oil and gas lease applications for permit to drill once the specific locations where drilling would occur are known.

CACA 052959 is located within the Salinas Management Area and is found on the Espinosa Canyon U.S. Geological Survey (USGS) topographic quadrangle (topo quad). The site is in rugged hilly terrain west of the Salinas Valley and includes a few old trails or fuelbreaks, some of which are at least partially overgrown. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities include Inner Annual Grassland/Forbland, Inner Coastal Scrub, and Inner Mixed Chaparral. Elevation ranges from around 850 to 1,800 feet.

CACA 052960 is located within the Salinas Management Area and is found on the Tierra Redondo Mountain and Hames Valley USGS topo quads. The site is in rugged hilly terrain southwest of the Salinas Valley. The site includes several dirt roads or trails, scattered small structures, and areas that may have been grazed or disced. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities include Inner Annual Grassland/Forbland, Inner Coastal Scrub, Inner Mixed Chaparral, and Inner Woodland. Elevation ranges from around 900 to 1,700 feet.

CACA 053824 is located within the Salinas Management Area in the Williams Hill area, and is found on the Espinosa Canyon and San Ardo USGS topo quads. The site is in rugged hilly terrain west of the Salinas Valley and includes several dirt roads or trails, a few structures, and some areas of disturbance. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities include Inner Annual Grassland/Forbland, Inner Coastal Scrub, and Inner Mixed Chaparral. Elevation ranges from around 900 to 1,600 feet.

CACA 053825 is located within the Salinas Management Area in the Williams Hill area, and is found on the Williams Hill, Espinosa Canyon, Hames Valley, and San Ardo USGS topo quads. The site is in rugged hilly terrain west of the Salinas Valley and includes several dirt roads or trails, including Lockwood San

Ardo Road. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities include Inner Annual Grassland/Forbland, Inner Coastal Scrub, Inner Mixed Chaparral, and Inner Woodland. Elevation ranges from around 1,000 to 2,200 feet.

CACA 053826 is located within the Salinas Management Area in the Williams Hill area, and is found on the Hames Valley USGS topo quad. The site is in rugged hilly terrain west of the Salinas Valley and includes several dirt roads or trails and a corral with associated structures. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities include Inner Annual Grassland/Forbland, Inner Coastal Scrub, and Inner Mixed Chaparral. Elevation ranges from around 1,200 to 2,400 feet.

CACA 053827 is located within the Salinas Management Area in the Williams Hill area, and is found on the Williams Hill USGS topo quad. The site is in hilly terrain west of the Salinas Valley and includes several dirt roads or trails and an area of disturbance. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities include Inner Annual Grassland/Forbland, Inner Coastal Scrub, Inner Mixed Chaparral, and Inner Woodland. Elevation ranges from around 1,600 to 2,300 feet.

CACA 053828 is located within the San Joaquin Management Area in the Call Mountain–Hernandez Valley area, and is found on the Panoche and Llanada USGS topo quads. The site is in rugged hilly terrain and includes large areas of grassland that are grazed by cattle. A few dirt roads or trails are evident, including one to the summit of Buck Peak. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities include Inner Annual Grassland/Forbland, Inner Coastal Scrub, Inner Mixed Chaparral, and Inner Woodland. There are also rocky outcrops with minimal vegetation. Elevation ranges from around 2,000 to 3,500 feet.

CACA 053829 is located within the San Joaquin Management Area in the Call Mountain–Hernandez Valley area, and is found on the Panoche USGS topo quad. The site is in rugged hilly terrain and includes large areas of grassland that are grazed by cattle. A few dirt roads or trails are evident, including Union Canyon Road. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities include Desert Annual Grassland/Forbland, Desert Scrub, Inner Annual Grassland/Forbland, Inner Coastal Scrub, and Inner Mixed Chaparral. Elevation ranges from around 2,100 to 2,900 feet.

CACA 053830 is located within the San Joaquin Management Area in the Call Mountain–Hernandez Valley area, and is found on the Panoche, Tumey Hills, Hernandez Reservoir, and Idria USGS topo quads. The site is in hilly terrain, rugged in places, and includes large areas of grassland are grazed by cattle. There are a few roads or trails. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities include Desert Annual Grassland/Forbland, Desert Scrub, Inner Annual Grassland/ Forbland, Inner Coastal Scrub, and Inner Mixed Chaparral. Elevation ranges from around 2,100 to 2,900 feet.

CACA 053831 is located within the San Joaquin Management Area in the Call Mountain–Hernandez Valley area, and is found on the Hernandez Reservoir USGS topo quad. The site is in rugged hilly terrain and includes some areas of grassland that are grazed by cattle. There are a few dirt roads or trails. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities Inner Annual Grassland/Forbland, Inner Coastal Scrub, and Inner Mixed Chaparral. Elevation ranges from around 1,900 to 4,000 feet.

CACA 053832 is located within the San Joaquin Management Area in the Call Mountain–Hernandez Valley area, and is found on the Hernandez Reservoir and Idria USGS topo quads. The site is in rugged hilly terrain and includes some areas of grassland that may have been grazed. There are a few dirt roads or trails. Drainages on the site are likely to support intermittent or ephemeral flows. One larger drainage on

the site may have perennial flow. Major vegetation communities are Inner Annual Grassland/Forbland, Inner Coastal Scrub and Inner Mixed Chaparral. Elevation ranges from around 1,900 to 3,500 feet.

CACA 053833 is located within the San Joaquin Management Area in the Griswold-Tumey Hills area, and is found on the Tumey Hills and Idria USGS topo quads. The site is in rugged hilly terrain and includes areas of grassland that may have been grazed. There are a few dirt roads or trails. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities include Desert Annual Grassland/ Forbland and Desert Scrub. Elevation ranges from around 1,500 to 2,500 feet.

CACA 053834 is mainly located within the San Joaquin Management Area with a small section in the San Benito Management Area. It is in the Griswold-Tumey Hills area, and found on the Idria USGS topo quad. The site is in rugged hilly terrain and includes areas of grassland that are grazed by cattle. There are a few dirt roads or trails, including Tumey Gulch Road. Drainages on the site support intermittent or ephemeral flows. Major vegetation communities include Desert Annual Grassland/Forbland and Desert Scrub. Elevation ranges from around 1,900 to 2,500 feet.

CACA 053835 is located within the San Joaquin Management Area in the Griswold-Tumey Hills area, and is found on the Idria USGS topo quad. The site is in rugged hilly terrain and includes areas of grassland that may have been grazed. There are a few dirt roads or trails, including New Idria Road. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities include Desert Annual Grassland/Forbland and Desert Scrub. Elevation ranges from around 1,600 to 2,900 feet.

3.11 Biological Resources – Wildlife Habitat

3.11.1 Introduction

The Hollister Field Office Resource Management Plan for the Southern Diablo Mountain Range and Central Coast of California describes the key fish and wildlife resources found within the Planning Area. The information below is summarized from the RMP FEIS and has been updated as needed (BLM, 2006).

Over 300 species of birds, mammals, reptiles, and amphibians occur or have the potential to occur within the Planning Area. These include several species of rare, threatened, and endangered animals addressed in Section 3.12. In analyzing management actions, this EIS addresses key species and their habitats. Key species include those of economic interest (e.g., native and non-native game animals); species or groups that serve as indicators of ecosystem health or the effects of management activities; and sensitive, rare, threatened, and endangered (RTE) species. Game animals may also be considered indicator species.

Game and indicator species include California mule deer (*Odocoileus hemionus californicus*) and Columbian black-tailed deer (*O.h. columbianus*), tule elk (*Cervus elaphus nannodes*), wild pig (*Sus scrofa*), mountain lion (*Felis concolor*), wild turkey (*Meleagris gallopavo*), California quail (*Callipepla californica)* and chukar (*Alectoris chukar*), and small game, nongame, and fur-bearing mammals.

Small game includes desert cottontail rabbit (*Sylvilagus auduboni*), brush rabbit (*Sylvilagus bachmani*), blacktailed jackrabbit (*Lepus californicus*), and western gray squirrel (*Sciurus griseus*). Nongame species include bobcat (*Lynx rufus*), coyote (*Canis latrans*), and California ground squirrel (*Spermophilus beecheyi*). Fur-bearing mammals that occur within the Planning Area are gray fox (*Urocyon cineroargenteus*), raccoon (*Procyon lotor*), and American badger (*Taxidea taxus*).

The Planning Area is within habitat that supports fauna representative of the central coast and the Central Valley. Vegetation communities are described in Section 3.10 (Vegetation). Table 3.11-1 lists the major vegetation communities found within the Planning Area and the key wildlife species typically associated with each.

Table 3.11-1. Major Vegetation Communities and Associated Key Wildlife Resources

Vegetation Community	Associated Key Wildlife Resources
Blue Oak Woodland Blue Oak–Foothill Pine Valley Oak Woodland Douglas Fir	Game and indicator: game species, mountain lion, Lewis woodpecker RTE: bats, raptors (nesting and roosting)
Mixed Chaparral	Game and indicator: game species, mountain lion RTE: bats, big-eared kangaroo rat, Bell's sage sparrow, coast horned lizard
Alkali Desert Scrub	RTE: Buena vista lake shrew, Fresno kangaroo rat, San Joaquin (Nelson's) antelope squirrel, San Joaquin kit fox, Tipton kangaroo rat, Tulare grasshopper mouse, giant kangaroo rat, San Joaquin Valley woodrat, riparian brush rabbit, short-nosed kangaroo rat, San Joaquin LeConte's thrasher, blunt-nosed leopard lizard, Ciervo aegialian scarab beetle, Doyen's trigonascuta dune weevil, San Joaquin dune beetle, desert glossy snake, San Joaquin coachwhip, side-blotched lizard, greater roadrunner
Annual Grasslands Perennial Grasslands	Game and indicator: game species, mountain lion RTE: coast horned lizard,
Riparian	Game and indicator species migrant songbirds RTE: riparian brush rabbit, riparian woodrat, California red-legged frog, foothill yellow-legged frog
Vernal Pool	RTE: fairy and tadpole shrimp, California tiger salamander, western spadefoot toad

3.11.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/Final EIS), refer to Appendix J.

3.11.3 Regional Setting

The BLM is responsible for managing the habitat on public lands that supports fish and wildlife. The U.S. Fish and Wildlife Service (FWS) and the California Department of Fish and Wildlife (CDFW) are primarily responsible for managing fish and wildlife species. These agencies coordinate many of their activities to meet objectives to maintain, protect, and enhance the abundance and diversity of native fish and wildlife resources.

3.11.4 Current Conditions and Trends

Central Coast Field Office Planning Area

The current conditions and trends for game and indicator wildlife species are summarized in Table 3.11-2. More detailed information can be found in the RMP FEIS (BLM, 2006). Game populations are managed based on habitat condition and the quality of the animals being produced. Population levels are linked to a variety of factors, including vegetation quality and quantity, adequate space, shelter, cover, water distribution, and regional weather patterns and trends such as prolonged drought. RTE plant and wildlife species are addressed in Section 3.12 (Special Status Species) of this document.

Table 3.11-2. Habitat Conditions and Population Trends for Key Game and Indicator Species in the Planning Area

Species	Habitat Condition	Population Trend
California mule deer Columbian black-tailed deer	Poor to good,[1-4] highly variable throughout planning area	Stable to declining
Tule elk	Poor to good,[1-4] highly variable throughout planning area	Increasing since the 1970s
Wild horse and burro	Not applicable	No herd units and no wild free-roaming horses and burros within the Planning Area
Wild pig	Poor to good[1-4], highly variable throughout planning area	Increasing and expanding
Wild turkey	Fair[1]	Increasing
Mountain lion	Fair[2,3]	Increasing
Upland game birds – California quail and chukar	Good[1]	Wide annual fluctuations, primarily due to timing and amount of rainfall
Small game, nongame, and fur-bearing mammals	Good[1,4]	Most species stable to increasing; badger decreasing

Basis of habitat condition assessment:
1 - Vegetation resource condition
2 - Development/density of intrusions
3 - Competition with other resources
4 - As reflected by population levels.

Fisheries

The coastal and inland drainages, watersheds, and small streams and rivers within the Planning Area support cool and warm water fisheries. Each of these waters supports or has the potential to support coastal rainbow trout and steelhead, and coho salmon populations. Warm water fisheries include the San Benito River and Laguna and Warthan Creeks.

All waters in the Planning Area are managed as wild fisheries, maintained by natural recruitment rather than stocking. With the exception of the coastal rainbow trout (*Oncorhynchus mykiss irideus*), the native fish species that occur within the Planning Area are considered nongame species. RTE fish species are addressed in Section 3.12 (Special Status Species) of this document.

Birds

A wide diversity of bird life is found throughout the Planning Area, including raptors, shorebirds, songbirds, and many others. Many of these species nest within BLM-managed lands within the Planning Area, while others may overwinter in the area, or be present seasonally, during migration. Most of these birds have no special conservation status (see Section 3.12 for special status species), but most birds are protected under State and Federal statutes; see Section 3.11.2. With the exception of a few non-native birds such as European starling, the take of any birds or active bird nests or young is regulated by these statutes.

Wildlife Movement and Biological Connectivity

Within the CCFO Planning Area, areas of habitat may be fragmented or isolated by development. Fragmentation and isolation of natural habitat may cause loss of native species diversity. Fish and wildlife movement among habitat areas is important to long-term genetic variation and demography. In the short term, fish and wildlife movement may also be important to individual animals' ability to occupy their home ranges, if their ranges extend across a potential movement barrier. These considerations are especially important for rare, threatened, or endangered species, and wide-ranging species such as large mammals, which exist in low population densities.

In landscapes where native habitats exist as partially isolated patches surrounded by other land uses, planning for fish and wildlife movement generally focuses on local "wildlife corridors" to provide animals with access routes among habitat patches. In largely undeveloped areas, fish and wildlife habitat is available in extensive open space areas throughout the region, but specific land uses or linear barriers may impede or prevent movement. In these landscapes, fish and wildlife movement planning focuses on sites where animals can cross linear barriers, but may not emphasize corridors among habitat areas.

Leases Subject to Settlement Agreement

Habitat condition and population trends for key game and indicator species on the 14 non-NSO leases, as identified in Hollister I and II, would be expected to be generally similar to those for the remainder of the Planning Area. All 14 leases would have habitat conditions and population trends for key game and indicator species the same as those presented in Table 3.11-2, including for deer and Tule elk, because they have the vegetation required for those species, see Section 3.10.4. For fisheries, all the lease lands are in hilly terrain with local watercourses being only small drainages and watersheds that support cool and warm water fisheries. A wide diversity of bird life is found throughout the 14 leases, including raptors, songbirds, and many others. Many of these species nest within BLM-managed lands within the Planning Area, while others may overwinter in the area, or be present seasonally, during migration. Within the 14 leases, areas of habitat are primarily undisturbed but near to area that may be fragmented or isolated by development. Fragmentation and isolation of natural habitat may cause loss of native species diversity.

3.12 Biological Resources – Special Status Species

3.12.1 Introduction

The Hollister Field Office Resource Management Plan (HFO RMP) for the Southern Diablo Mountain Range and Central Coast of California describes the special status species that occur or may occur within the Planning Area. Unless otherwise cited, the information below is summarized from the RMP Final EIS (BLM, 2006) and has been updated as needed.

BLM considers special status species to include the designations listed in Table 3.12-1.

Table 3.12-1. Definitions of Special Status Species

Species Designation	Agency	Definition
Federal Endangered	USFWS	A species that is in danger of extinction throughout all or a significant portion of its range.
Federal Threatened	USFWS	A species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
Federal Candidate	USFWS	A species the USFWS has designated as a candidate for listing under Section 4 of the ESA, published in its annual candidate review, and defined as a species that has sufficient information on its biological status and threats to propose it as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities.
Federal Proposed	USFWS	A species that the USFWS has proposed for listing under Section 4 of the ESA, by publishing a Proposed Rule in the Federal Register.
Bald and Golden Eagle Protection Act	USFWS	Prohibits take of bald and golden eagles without a permit issued by the Secretary of the Interior.
Birds of Conservation Concern	USFWS	The migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent the highest conservation priorities.
Species of Concern	USFWS	Species of Concern is an informal term that refers to species that are declining or appear to be in need of conservation actions. Species of Concern receive no legal protection and the use of the term does not necessarily mean that the species will eventually be proposed for listing as a threatened or endangered species. The Sacramento USFWS Office does not maintain a Species of Concern list. However, the RMP FEIS (BLM, 2006) listed several species with this designation, and it has been retained here for consistency with that document.
Marine Mammal Protection Act	NOAA	Prohibits, with certain exceptions, the take of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S.
BLM Sensitive Species	BLM	BLM sensitive species are designated by the BLM California State Director in cooperation with the CDFW, as species that meet one or more of the following criteria: ▪ Could become endangered in or extirpated from a state or within a significant portion of their distribution; ▪ Status is under review by the USFWS or NMFS; that are undergoing or are predicted to undergo significant downward trends in habitat capability that would reduce their distribution; ▪ Populations or densities are declining significantly or that are predicted to decline significantly such that it becomes necessary to designate their Federal status as listed, proposed, or candidate or to designate their State status as listed; Typically have small and widely dispersed populations; Inhabit ecological refugia or other specialized or unique habitats; State listed, but that may be better conserved under BLM sensitive species status. BLM sensitive species also include CRPR 1B plant species (see below) that are not federally listed or proposed for listing.

Table 3.12-1. Definitions of Special Status Species

Species Designation	Agency	Definition
State Endangered	CDFW	A species that is in serious danger of becoming extinct throughout all or a significant portion of its range due to one or more causes, including loss or change in habitat, overexploitation, predation, competition, or disease.
State Threatened	CDFW	A species that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts.
State Candidate	CDFW	A species that is under review by the CDFW for addition to the threatened or endangered species lists, on direction from the California Fish and Game Commission. Take of CESA candidate species is prohibited unless authorized by CDFW under Fish and Game Code Section 2081.
Fully Protected	CDFW	Animal species fully protected under the California Fish and Game Code. The CDFW may not issue take authorization except for scientific purposes or under the terms of a natural community conservation plan (NCCP).
Protected furbearers	CDFW	Applies to fisher, marten, river otter, desert kit fox, and red fox.
Species of Special Concern	CDFW	A species, subspecies, or distinct population of an animal native to California that currently satisfies one or more of the following (not necessarily mutually exclusive) criteria: ▪ Is extirpated from the State or, in the case of birds, from its primary seasonal or breeding role; ▪ Is on the Federal, but not State list, of threatened or endangered species; ▪ Meets the State definition of threatened or endangered but has not formally been listed; ▪ Is experiencing or formerly experienced serious (noncyclical) population declines or range retractions (not reversed) that, if continued or resumed, could qualify it for State threatened or endangered status; or ▪ Has naturally small populations exhibiting high susceptibility to risk from any factor(s) that, if realized, could lead to declines that would qualify it for State threatened or endangered status. SSC is an administrative designation and carries no formal legal status. This designation is intended to focus attention on animals at conservation risk, to stimulate research on poorly known species, and to achieve conservation and recovery before these species meet the California Endangered Species Act (CESA) criteria for listing. California SSC are considered under the California Environmental Quality Act (CEQA) and require a discussion of impacts and appropriate mitigation to reduce impacts.
Watch List	CDFW	Taxa that were previously SSCs but no longer meet SSC status, or do not meet SSC criteria, but for which there is concern and a need for additional information to clarify status.
Protected	CDFW	An animal species that is not federally or State-listed, FP, or SSC, but is protected under the California Fish and Game Code.
Special Animals	CDFW	All of the species the CNDDB is tracking, regardless of their legal or protection status. CDFW considers these species to be those of greatest conservation need.
Rare Plant	CDFW	Plants designated by the State Fish and Game Commission as rare and protected under the Native Plants Protection Act.
CRPR 1A	CDFW	Plants presumed to be extinct in California.
CRPR 1B	CDFW	Plants rare or endangered in California and elsewhere.
CRPR 2	CDFW	Plants rare or endangered in California, but more common elsewhere.
CRPR 3	CDFW	Plants about which more information is needed – a review list.
CRPR 4	CDFW	Plants of limited distribution – a watch list.

Source: BLM, 2006, 2012, 2013a, 2013b; CDFW, 2015a; CNPS, 2015b; NOAA Fisheries, 2014; USFWS, 2012a, 2012b, 2014.
CRPR = California Rare Plant Rank.

The ESA mandates that all Federal agencies use their authorities to further the purposes of the ESA by carrying out programs for conserving endangered and threatened species. The ESA also requires a Federal agency to ensure that any action it authorizes, funds, or implements is not likely to jeopardize the continued existence of any endangered or threatened species or to destroy or adversely modify designated critical habitat. BLM policy is to conserve federally listed species and the ecosystems on which they depend. It is also BLM policy to ensure that BLM actions are consistent with the conservation needs of all special status species and not to contribute to a need for ESA listing of any special status species.

Consultation with the USFWS and NMFS NOAA Fisheries is required by the Endangered Species Act for Federal actions that may affect listed species and designated critical habitat. The consultation process ensures that actions taken are not likely to jeopardize the continued existence of any threatened or endangered species or their critical habitat.

3.12.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/EIS), refer to Appendix J.

3.12.3 Regional Setting

The BLM has completed or is in the process of identifying areas of ecological importance, designating priority species and habitats, and identifying restoration strategies, opportunities, and management decisions to protect or prevent avoidable loss of habitat supporting special status species within the Central Coast, Salinas, San Benito, and San Joaquin Management Areas. The information needed for the RMP and leasing decision is provided in Section 3.12.4 as it provides an overview of known or potential occurrences of special status species within the Planning Area and within the non-NSO leases.

3.12.4 Current Conditions and Trends

Central Coast Field Office Planning Area

Tables L-1 and L2 in Appendix L identify known or potential occurrences of special status species within the Planning Area. This information is based on the RMP FEIS (BLM, 2006) and current CNDDB (CDFW, 2015c) and Calflora (2015) records of species within the Planning Area.

Critical habitat for 14 animal species or DPS and 13 plant species occurs within the Planning Area. Critical habitat for six of these species includes BLM surface or split estate lands; see Table L-1 in Appendix L. Critical habitat found within the Planning Area is shown on Figures 3.12-1a and 3.12-1b.

Figures 3.12-2a through 3.12-2e and 3.12-3a through 3.12-3e depict special status species occurrences within the Planning Area, with federally listed species shown on Figure 3.12-2 and other special status species on 3.12-3. A brief description of many of these species can be found in Appendix E of the RMP FEIS (BLM, 2006). Note that some species occurrences may not have been documented in the CNDDB and site-specific analysis is required to determine the presence or absence of a particular species.

There are 88 federally listed or candidate species or distinct population segments (DPS) that occur within the Planning Area, including 46 plants and 42 animals. Several of these species are known to occur or are likely to occur on BLM lands; see Table L-1 in Appendix L.

There are 197 additional special status species (137 plant and 60 animal species) that occur within the Planning Area, 129 of these are designated as BLM sensitive species (100 plant and 29 animal species). Several of these species are known to occur or are likely to occur on BLM lands; see Table L-2 in Appendix L.

Federally Listed Species

Species that are federally listed, proposed for listing, or candidates for listing under the ESA are listed in Table L-1 in Appendix L along with current conservation status, presence of designated critical habitat within the Planning Area (on BLM surface, split estate, and non-BLM lands), and known occurrence within the Planning Area (on BLM surface, split estate, and non-BLM lands).

Other Special Status Species

Table L-2 in Appendix L provides current conservation status and occurrence within the Planning Area for special status species that are not federally listed.

Management Areas

See Tables L-1 and L-2 in Appendix L for a list of the special status species known or likely to occur in each Management Area and the conservation status for each. Additional information on a few notable species is summarized from the RMP FEIS (BLM, 2006) and provided below.

Central Coast Management Area

There are two main areas of BLM-administered lands within the Central Coast Management Area — the Cotoni–Coast Dairies unit of the California Coastal National Monument and the Fort Ord National Monument. Neither of these lands are available for oil and gas development.

Salinas Management Area

Although the Salinas Management Area falls within the range of multiple special status species, only the prairie falcon has been recorded as occurring on these lands (BLM, 2006). The following special status species are expected to occur area-wide, or their specialized habitat criteria are met within this management area: California red-legged frog, western pond turtle (*Emys marmorata*), western spadefoot toad (*Spea hammondii*), arroyo toad (*Anaxyrus californicus*), California tiger salamander (*Ambystoma californiense*), coast horned lizard (*Phrynosoma blainvillii*), two-striped garter snake (*Thamnophis hammondii*), Smith's blue butterfly, and least Bell's vireo (*Vireo bellii pusillus*).

San Benito Management Area

Special status plants occurring on Federal mineral estate within the San Benito Management Area include the San Benito evening-primrose (*Camissonia benitensis*). Previously known only from serpentine alluvial flats, terraces, and alluvial outwash terraces and deposits near San Benito Mountain (USFWS, 2009, pg. 2), the known range of the species has recently been extended south into Monterey County at Highway 198 just west of Priest Valley, and its habitat type has been broadened to include serpentine alluvial stream terraces, serpentine geologic transition zone (serpentine soils in uplands along geologic boundaries), serpentine rock outcrops, and greywacke outcrops.

Sensitive wildlife species occurring on BLM-managed lands within the San Benito Management Area include the foothill yellow-legged frog (*Rana boylii*), two-striped garter snake, western pond turtle, silvery legless lizard (*Anniella pulchra pulchra*), coast horned lizard, and multiple birds and mammals that occur area-wide (e.g., California condor). Species that have not been encountered during surveys on BLM-managed lands but may occur within the area include special status invertebrates, California red-legged frog, western spadefoot toad, and California tiger salamander.

San Joaquin Management Area

The San Joaquin Management Area lies within the Central Valley of California, which is comprised of the San Joaquin and Sacramento Valleys. Historically, the habitats found in the Central Valley were valley

grasslands, freshwater wetlands, and riparian woodlands. This area has been impacted by agriculture and development, with resulting habitat loss and degradation. A number of upland species of the San Joaquin Valley have been federally listed. The USFWS published the Recovery Plan for Upland Species of the San Joaquin Valley, California in 1998 (USFWS, 1998). This recovery plan addresses 34 species of plants and animals that occur within the San Joaquin Valley, the majority of which occur in arid grasslands and scrublands. The ultimate goal of this recovery plan is to delist the 11 endangered and threatened species and ensure the long-term conservation of the 23 species of concern. Multiple species presented within the recovery plan occur on lands managed by the CCFO and are classified as threatened or endangered or are considered sensitive species. This recovery plan is further detailed below.

The California jewelflower (*Caulanthus californicus*) is found on BLM-managed land in the Kreyenhagen Hills in Fresno County (USFWS, 1998, pg. 27). San Joaquin woollythreads (*Monolopia congdonii*) is found on BLM-managed land in the Jacalitos Hills and Panoche Hills (USFWS, 1998, pg. 46) and at Panoche Creek, Monocline Ridge, and Kettleman North Dome.

The Panoche Hills management unit includes approximately 7,800 acres of significant habitat areas for sensitive species in the "plateau area" of the Panoche Hills, designated as an Area of Critical Environmental Concern (ACEC). There are four sensitive wildlife species found in the management unit: the San Joaquin kit fox (*Vulpes macrotis mutica*), blunt-nosed leopard lizard (*Gambelia silus*), the giant kangaroo rat (*Dipodomys ingens*), and the San Joaquin antelope squirrel (*Ammospermophilus nelsoni*). The BLM has documented giant kangaroo rat colonies within the Panoche Hills plateau area. Additional colonies occur adjacent to the management unit in the extreme southeastern portion of the Panoche Hills outside of BLM-managed land.

The Griswold-Tumey Hills management unit has also designated 2,500 acres of significant habitat areas for sensitive species in the "plateau area" in the northern Tumey Hills. Three sensitive species — the San Joaquin kit fox, giant kangaroo rat, and San Joaquin antelope squirrel — have been observed in the Tumey Hills Plateau area. The blunt-nosed leopard lizard has also been observed on private lands adjacent to the Tumey Hills management unit in eastern Panoche Valley. Several kit fox dens and kangaroo rat colonies occur within the management unit and on adjacent private lands. Both the Panoche Hills and Tumey Hills management units may have some of the largest active giant kangaroo rat colonies outside of San Luis Obispo County.

The Ciervo Hills/Joaquin Rocks management unit has approximately 9,700 acres designated for sensitive species. The San Joaquin kit fox, giant kangaroo rat, and San Joaquin dune beetle (*Coelus gracilis*) have been documented within the management unit. The San Joaquin dune beetle has been confirmed at five of the seven duneland soil areas. These duneland soil areas support Mojave Desert vegetation communities in seven distinctly separate areas comprising approximately 1,000 acres along the Monocline Ridge.

The Coalinga management unit has 14,660 acres designated for sensitive species, which include the San Joaquin kit fox and the blunt-nosed leopard lizard. The management unit also has habitat that may support the giant kangaroo rat, and species surveys for its presence are ongoing.

In addition to those species noted above, other sensitive species occurring within management units of the San Joaquin Management Area are: the short-nosed kangaroo rat (*Dipodomys nitratoides brevinasus*), San Joaquin pocket mouse (*Perognathus inornatus inornatus*), Ciervo aegilian scarab beetle (*Aegiala concinna*), Doyen's trigonoscuta dune weevil (*Trigonoscuta sp.*), molestan blister beetle (*Lytta molesta*), and the Morrison's blister beetle (*Lytta morrisoni*).

San Joaquin Valley Recovery Plan

Portions of the Planning Area are within the San Joaquin Valley. The *Recovery Plan for Upland Species of the San Joaquin Valley, California* (USFWS, 1998) uses an ecosystem-level strategy to address recovery

and conservation of 11 listed species and 23 additional special status species. The strategy includes several elements that relate to the management of public land:

- The primary focus of recovery should be on publicly owned lands;
- Conservation efforts should focus on fewer larger blocks of land rather than smaller more numerous parcels;
- Blocks of conservation lands should be connected by natural land or land with compatible uses that allow for movement between blocks;
- Emphasis should be placed on the San Joaquin kit fox as an umbrella species. Since most other species require less habitat, fulfilling the management and habitat needs of the San Joaquin kit fox will also meet the needs of many other species;
- The giant kangaroo rat and San Joaquin kangaroo rat are keystone species in their communities. Protection of these keystone species should be a high priority since they provide an important or essential function for many other listed and special status species;
- Uses and actions on public land, such as livestock grazing, oil, gas, and mineral exploration and extraction, hunting, and recreation should occur so as minimize degradation of habitat for special status species;
- Use specialty preserves or small reserves to manage species with highly restricted geographic ranges or specialized habitat requirements or that are vulnerable to traditional land uses;
- Target existing natural lands occupied by special status species over unoccupied natural land and retired farm land for conservation;
- Coordinate carefully agricultural land retirement with endangered species recovery for species where sufficient occupied natural land does not exist, but where it is needed to increase population size or promote movement between populations;
- Enhance landscape features that allow successful survival and movement from population centers on the valley floor to the valley perimeter for species such as the kit fox that can live in or move through the farmland matrix; and
- Implementing the recovery plan should be complementary to existing and future habitat conservation plans.

The foundation of the regional conservation strategy is a system of reserves and connecting corridors. Through assessments of remaining natural land habitats, a reserve system concept was developed to conserve the best remaining habitats of the San Joaquin Valley natural communities (USFWS, 1998). Several large keystone reserves, several small specialty reserves, and connecting corridors linking many of the reserves have been established or proposed. The large reserves are intended to maintain and conserve multiple plant and animal listed species as a natural community, while the small reserves are designed to conserve a particular species or unique natural feature. These reserves are managed for long-term conservation of the listed plants and animals and the natural communities on which they depend, but allow for a variety of land uses managed in a compatible manner. Both large and small reserves are necessary to conserve the valley's biological resources.

Reserves include both large multispecies reserves and small specialty reserves that would be managed primarily for listed plants and animals. While other compatible resource uses could occur, habitat quality and species' populations would be maintained through implementing specific design features for these resource uses. Management of the reserves would be assured by fee acquisition, by Federal, State, or local agencies, chartered conservation organizations, conservation easements, or long-term cooperative agreements with landowners. The goal is to maintain a certain percentage of the native lands as high-quality habitat and to rehabilitate lands with nonnative species as they become available for purchase, easement, or agreement.

A threshold for habitat disturbance from energy mineral development, roads, and facilities would be established. Reserves and connecting corridors would have different thresholds for habitat disturbance. Compensation for new habitat disturbance within the threshold would be at a standard rate for uses that are considered permanent habitat loss and at another standard rate for temporary habitat loss. Compensation is generally in the form of preserving additional habitat to make up for the loss of habitat associated with approved projects.

Connecting corridors are composed of native and agricultural lands to be managed for maintaining interchange and gene flow between the primary reserves and for maintaining supplemental populations between reserves. Emphasis is to maintain a certain percentage of native lands as moderate- to high-quality habitat and to maintain a certain percentage of the agricultural lands in agricultural production or fallow. A certain percentage of these lands would be available for urban, industrial, or other land uses that are considered permanent habitat loss. Land use design would maintain corridor integrity as extant habitat and for wildlife movements. Permanent habitat loss from urban-industrial uses would not sever wildlife corridors. Compensation for habitat loss in corridors would be directed to the reserve areas; however, limited compensation could be directed back to the corridor. The compensation ratio is the same as for reserves. Corridors would not normally involve purchase but would be secured through conservation easements and agreements. However, some parcels essential to maintain corridors or buffers may need to be purchased.

The Recovery Plan identifies a system of reserves referred to as "core recovery areas" within which certain tasks need to be accomplished in order for down- or delisting to occur. The Endangered Species Recovery Program published a set of maps that establish geographic polygons for the recovery areas (ESRP, 2013). One such recovery area, the Ciervo-Panoche Natural Area (CPNA), is located entirely within the Planning Area (Figure 2-1 to Figure 2-6). Within the CPNA the Recovery Plan requires that the following species-specific criteria be met.

- Giant kangaroo rat: "Secure and protect...from incompatible uses" "All occupied lands [in the CPNA] as specified in recovery strategy."
- Blunt-nosed leopard lizard: "Secure and protect...from incompatible uses" an area of "about 2428 hectares (5,997 acres)" "in the foothills" of the CPNA.
- San Joaquin kit fox: "Secure and protect…from incompatible uses" "the Ciervo–Panoche Area" [sic]

On native lands outside the reserve and corridor system, management for the retention of habitat values has not been the focus. Most of these lands have some habitat value, and many of these areas may be valuable sources of plant and animal populations in the short term. Most of these values will continue to exist, unless there are dramatic changes in current land uses.

Leases Subject to Settlement Agreement

The 14 non-NSO leases, as identified in Hollister I and Hollister II, are located in the Salinas and San Joaquin Management Areas, with a small section of one parcel within the San Benito Management Area. These leases are not located on any ACECs, but some (Leases CACA 053828 – 400 acres, 053829 – 900 acres, 053830 – 1,110 acres, 053831 – 280 acres, 053832 – 160 acres, 053833 – 610 acres, 053834 – 1,070 acres, and 053835 – 390 acres) are within or partially within the Ciervo-Panoche Natural Area.

The species listed in Tables L-1 and L-2 in Appendix L for these Management Areas and species that may occur area-wide have the potential to occur on the lease lands. There are records in the CNDDB (CDFW, 2015c) of several special status species on or within 1 mile of the lease lands. CNDDB records within 1 mile of the leases include:

- blunt-nosed leopard lizard
- Carmel Valley bush-mallow
- coast horned lizard
- Diablo Range hare-leaf
- giant kangaroo rat
- Indian Valley bush-mallow
- Lemmon's jewelflower
- Nelson's antelope squirrel
- Panoche pepper-grass
- Prostrate vernal pool navarretia
- San Benito evening-primrose
- San Benito onion
- San Joaquin kit fox
- Showy golden madia
- Tulare grasshopper mouse
- Western Heermann's buckwheat
- Western pond turtle
- California glossy snake
- chaparral ragwort
- Crotch bumble bee
- foothill yellow-legged frog
- Hall's tarplant
- Jolon clarkia
- Monterey dusky-footed woodrat
- Pale-yellow layia
- Prairie falcon
- San Antonio collinsia
- San Benito fritillary
- San Francisco collinsia
- San Joaquin woollythreads
- Straight-awned spineflower
- Umbrella larkspur
- Western mastiff bat

See Tables L-1 and L-2 in Appendix L for more information regarding these species and Figures 3.12-4 for plant species and 3.12-5 for wildlife occurrences. There is no designated critical habitat on the lease lands, but critical habitat for steelhead (Leases CACA 053831 and 05832), vernal pool fairy shrimp (Leases CACA 053831, 05832, 053827, and 053825), and Santa Lucia purple amole (Leases CACA 053827 and 053825) is located in the vicinity of lease lands; see Figures 3.12-1a and 3.12-1b. Field surveys to assess conditions of wildlife habitat and identify conditions of approval are completed at the project level and would be required to provide more detailed information.

3.13 Visual Resource Management

3.13.1 Introduction

Visual resource management (VRM) involves evaluating the scenic value of landscapes, determining appropriate levels of management, analyzing potential visual impacts, and applying visual design techniques to maintain scenic quality and reduce visual impacts. The purpose of visual resource management is to manage the quality of the visual environment and reduce the visual impact of development activities while maintaining the viability of all resource programs.

3.13.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/ EIS), refer to Appendix J.

3.13.3 Regional Setting

The Planning Area consists of non-contiguous lands and isolated parcels in 11 counties in central California, and the landscape varies greatly from nearly flat to rugged, mountainous terrain. Elevations range from near sea level to more than 5,000 feet. The lands managed by the CCFO are bounded by the Pacific Ocean on the west and the San Joaquin Valley on the east. They include a variety of settings and landforms including the Central Coast Ranges, the Salinas and San Joaquin valleys, and three major watersheds: the Pajaro, which drains into the Pacific Ocean; and Arroyo Pasajero and Silver Creek, which drain into the San Joaquin Valley.

Vegetation in the Planning Area includes forested areas, chaparral, and grassland. About two-thirds of the public lands managed by the CCFO consist of chaparral and oak woodland vegetation. Approximately one-third of the public lands (primarily on the eastern slopes of the Diablo Mountain Range and the southern Salinas Valley) consist of annual grassland and half-shrub vegetation.

3.13.4 Current Conditions and Trends

Central Coast Field Office Planning Area

BLM-managed lands in the Planning Area have been divided into four Management Areas (MAs): Central Coast MA (13,100 acres), San Joaquin MA (164,700 acres), Salinas MA (31,100 acres), and San Benito MA (70,500 acres). A brief description of the current conditions in each MA is provided below.

Central Coast Management Area. There are seven small, widely scattered BLM holdings in this MA. The BLM also manages 7,200 acres of Fort Ord National Monument (VRM Class II), which holds some of the last undeveloped natural wildlands along the Monterey Peninsula and is designated a Special Recreation MA. The BLM manages approximately 5,600 acres in Santa Cruz County known as the Cotoni-Coast Dairies unit of the California Coastal National Monument but does not have mineral estate rights. While no VRM class has yet been assigned to the Cotoni-Coast Dairies, the management objective for the unit would be managed as VRM Class II, similar to Fort Ord National Monument.

San Joaquin Management Area. BLM public lands in this MA are highly visible from Interstate (I-) 5. Scenery in this area is typical of the grassy hills along the western edge of the San Joaquin Valley. In the Panoche Hills area (VRM Class III except for the Panoche Hills WSA, which is VRM Class I), west of I-5, two large communication sites are visible on the ridgeline but do not dominate the landscape, which is characterized by annual grasslands and scattered California junipers.

The Griswold-Tumey Hills area (VRM Class III) lies due east of the Call Mountain–Hernandez Valley area (VRM Class III), just west of the I-5 corridor. Major drainages in the area are Panoche Creek, Silver Creek,

Griswold Creek, and Tumey Gulch — all intermittent streams with some portions flowing during most of the year. Vegetation and topography are similar to the Panoche Hills. Much of the rolling, grassy hills of this area are visible from I-5 and, therefore, are an important visual resource. The Griswold-Tumey Hills area contains a portion of one active oil and gas field.

South of the Griswold-Tumey Hills area and also adjacent to the I-5 corridor lies the Ciervo Hills (VRM Class III)–Joaquin Rocks (VRM Class II) area. The predominant feature in this area is the Diablo Range culminating in Joaquin Ridge, Joaquin Rocks, and Black Mountain. These arid foothills in the rain shadow of the Diablo Range are characterized by annual grassland/shrub vegetation and steep, chaparral- and oak-covered slopes. Cantua Creek is the major drainage in the area. The Joaquin Rocks area contains three, 300-foot high sandstone monoliths that jut from Joaquin Ridge and are visible from the Central Valley attracting viewers along a 20-mile stretch of I-5.

In the southern portion of the San Joaquin MA lies the Coalinga Mineral Springs area (VRM Class III). The predominant feature in the landscape is Juniper Ridge culminating in Sherman Peak (3,857 feet), Kreyenhagen Peak (3,561 feet), and Bald Mountain–Center Peak (4,541 feet). The topography in this area is typical of the inner Central Coast Range with steep, rugged canyons; sandstone cliffs; and escarpments. Warthan Canyon offers views of considerable visual interest along Highway 198. Vegetation in this region is typically mixed chaparral and chamise chaparral. There are some areas of oak savannah and oak woodland, especially in canyon bottoms and on north-facing slopes. Yucca and California juniper are also common in this region and contribute to the scenic quality of the area. There are many springs in the area including Coalinga Mineral Springs.

In the Coalinga area east of Coalinga Mineral Springs, the predominant features are the low, rolling foothills and valley grasslands along the western edge of the San Joaquin Valley. Significant topographic features include the Kettleman Hills, the Kreyenhagen Hills, the Alcalde Hills, and Anticline Ridge. This very arid area lies in the rain shadow of the Diablo Range to the west.

Salinas Management Area. The Sierra de Salinas area (VRM Class III) is visible from Highway 101, from the U.S. Forest Service Ventana Wilderness Area, and from BLM-managed lands adjacent to the Ventana Wilderness Area. Most of BLM's holdings in this area lie east of Los Padres National Forest and its steep, rugged mountains. BLM-managed lands lie primarily along the base and lower slopes of the Santa Lucia Range in Arroyo Seco Canyon, Reliz Canyon, and at the north end of the Ventana Wilderness Area. The area is characterized by dense chaparral with small areas of blue oak savannah. In this MA, the Sierra de Salinas Mountains are deeply dissected by many intermittent drainages, as well as by the Arroyo Seco and Carmel rivers.

The Williams Hill area (Class IV) in the southern portion of the Salinas MA offers views of the surrounding Salinas Valley. Pine trees, chamise, scrub oak, and shale formations characterize the hilly terrain.

A few other isolated BLM parcels (VRM Class IV) lie in eastern Monterey County at the San Benito County line, about 5 miles west of the National Park Service Pinnacles National Park. BLM-managed lands in this area generally lack features of notable visual quality and are typical of the region.

San Benito Management Area. BLM-managed lands in this area lie in the southern portion of the MA. The Call Mountain–Hernandez Valley area (VRM Class III) lies in the east-central portion of the MA. The most predominant feature of the MA is the rugged Diablo Range, and the area is characterized primarily by chaparral vegetation with some small stands of blue oak savannah. The San Benito River flows northwest from the Hernandez Reservoir through the central portions of the MA. Laguna Creek is the other major perennial stream in the MA, flowing into Hernandez Reservoir. The remaining BLM-managed lands in this MA are in two areas in the south: one adjacent to the Clear Creek–Condon Peak area and the other a block of BLM-managed lands west of Clear Creek called Laguna Mountain (VRM Class III). Laguna Mountain contains somewhat rugged terrain in an area of rolling hills covered in dense brush. This area is popular with hikers and has a small waterfall accessible by a hiking trail.

Leases Subject to Settlement Agreement

The leases subject to the settlement agreement are located in the Salinas and San Joaquin MAs (see above for landscape descriptions). In the Salinas MA, Leases CACA 052960, 052959, 053825, 053824, 053827, 053826 occur in the Williams Hill area that is designated VRM Class IV. In the San Joaquin MA, CACA Leases 053828, 053829, 053830, 053833, and 053834 are located in the Griswold-Tumey Hills area that is designated VRM Class III and Leases CACA 053835, 053832, and 053831 are on lands designated VRM Class IV south of Griswold-Tumey Hills.

3.14 Special Management Areas

3.14.1 Introduction

The Federal Land Policy and Management Act (FLPMA) directs the BLM to consider and evaluate lands for a number of special designations during its land use planning process. In general, lands are eligible for special designations based on the presence of particular values and qualities; lands found to possess these qualities are characterized as Special Management Areas (SMAs). SMAs receive designation or special management through different processes and are managed under special considerations.

According to the BLM's Land Use Planning Handbook, special designations fall into two categories: (1) Congressional designations (i.e., those applied by statute or Presidential proclamation), and (2) Administrative designations (i.e., those applied by the BLM through the land use planning process) (BLM, 2005). Congressional and Administrative designations that are applicable to this RMPA/EIS include national monuments, national recreation and historic trails, Areas of Critical Environmental Concern, Research Natural Areas, Wilderness Areas, and Wilderness Study Areas. These designations are described in Section 3.14.3. Wild and Scenic Rivers, also a BLM special designation, is discussed in Section 3.21.

The Central Coast Field Office has inventoried the BLM-administered lands in their jurisdiction for wilderness characteristics. These areas do not fall into either category listed above for SMAs, but they are described in this section because of the overlap with other special designations. The BLM 6310 Manual contains policy and guidance for conducting wilderness characteristics inventories under Section 201 of FLPMA. The BLM 6320 Manual also contains policy and guidance for considering lands with wilderness characteristics in the BLM land use planning process under FLPMA.

The BLM's policy provides that consideration of management alternatives for lands with wilderness characteristics is outside the scope of this particular planning process (as dictated by the statement of purpose and need for the planning effort). Therefore, the BLM's RMPA does not consider new land use decisions or management actions for lands with wilderness characteristics. Nonetheless, the Final EIS associated with the plan amendment still analyzes effects of the range of management alternatives on lands with wilderness characteristics.

3.14.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/EIS), refer to Appendix J.

3.14.3 Regional Setting

For the SMA analysis, the planning area for this RMPA/EIS is defined as the SMAs that are currently designated within the CCFO Planning Area boundary and are managed by the BLM (see Figure 3.14-1). Amendments to the BLM's RMP to address oil and gas leasing and development would apply only to BLM-managed lands. Consequently, SMAs located within the CCFO Planning Area boundary that are managed by other Federal agencies, and are not located on BLM-administered lands, are also not included in the planning area.

National Monuments

There are currently two national monuments within the planning area (see Figure 3.14-1):

- **California Coastal National Monument.** The monument includes more than 20,000 rocks, islands, exposed reefs, and pinnacles along the California coast (BLM, 2015a). The BLM manages the portions of the monument that extend within its CCFO Planning Area boundary in San Mateo, Santa Cruz, and Monterey Counties.

- **Fort Ord National Monument.** The monument was established to protect its scenic and natural resources, and to maintain the cultural and historic significance of this former U.S. Army training center and deployment staging ground (BLM, 2015b).

National Trails

The planning area includes the following two national trails (see Figure 3.14-1):

- **Juan Bautista de Anza National Historic Trail.** This trail was designated in the National Trails System Act of 1968 and designated a Millennium Trail in 2000. The trail follows portions of the overland route traveled by Captain Juan Bautista de Anza of Spain from Sonora, Mexico, to the vicinity of San Francisco, California. Portions of the trail traverse Federal mineral estate in Santa Clara County. The BLM also manages a 12-mile portion of the trail route across the Fort Ord National Monument.
- **Coalinga Mineral Springs National Recreation Trail.** This trail was designated under the National Trails System Act in 1981. The trail is located on the southern tip of the Diablo Mountains, and extends approximately 2.5 miles to Kreyenhagen Peak. The area around the trail is popular for hunting, especially for wild pigs that inhabit the surrounding area (BLM, 2015c).

Areas of Critical Environmental Concern and Research Natural Areas

There are currently two RNAs and three ACECs within the planning area (see Figure 3.14-1):

Research Natural Areas

- **Monvero Dunes.** This RNA designated by BLM in 2007 is characterized as a sand dune ecosystem dominated by disjunct plant species that typically occur in the Mojave Desert such as Mojave sand verbena (*Abronia pogonantha*), birdcage evening primrose (*Oenothera deltoides*), wild rhubarb (*Rumex hymenosepalus*), and sand grass (*Stipa hymenoides*) The following federally endangered species are known to occur within or along the edges of the proposed Monvero Dunes RNA: San Joaquin woollythreads (*Monolopia congdonii*), blunt-nosed leopard lizard (*Gambelia sila*), and San Joaquin kit fox (*Vulpes macrotis mutica*) (BLM, 2015d).
- **San Benito Mountain.** This RNA was designated by the BLM in 1999 to encourage scientific research and provide protection for the unique conifer forest and serpentine vegetation communities on and around San Benito Mountain. The San Benito Mountain Forest is the only forest in the world that supports Jeffrey (*Pinus jeffreyi*), Coulter (*Pinus coulteri*), and Foothill pine (*P. sabinaiana*) incense cedar (*Calocedrus decurrens*), and Jeffrey-Coulter hybrids. The federally listed threatened San Benito evening-primrose (*Camissonia benitensis*) also occurs in this area (BLM, 2015e).

Areas of Critical Environmental Concern

- **Clear Creek Serpentine ACEC.** This 31,000-acre ACEC was designated in the 1984 Hollister RMP based on the human health risk associated with the naturally occurring asbestos and the occurrence of special status plant species endemic to the area (BLM, 2014a, pg. 1-1).
- **Panoche-Coalinga ACEC.** This ACEC was established to protect its significant habitat for rare, threatened, and endangered plants and wildlife, as well as its important historic and paleontological resources (BLM, 2015f). The ACEC stretches from the Panoche Hills southwards to Coalinga connecting a vast landscape of ancient desert-like habitats and open space with outstanding scenic and recreational values in the western San Joaquin Valley. These lands, administered by the CCFO, are known as the "San Joaquin Desert Hills" (BLM, 2014b).
- **Joaquin Rocks ACEC.** This 8,000-acre ACEC is accessible only by traveling through the Clear Creek Serpentine ACEC. This rugged and remote area is notable for its 300-foot high sandstone monoliths that jut from Joaquin Ridge.

Wilderness/Wilderness Study Areas

Wilderness studies were completed for all BLM lands as a requirement under Section 603 of the FLPMA. Wilderness areas are subject to specific management criteria, and their designation cannot be changed except by Congressional action. Wilderness areas and WSAs were closed to oil and gas leasing under the 2007 HFO RMP and would continue to be closed under all alternatives in the RMPA.

A total of three Wilderness Areas and five WSAs are located within the CCFO Planning Area boundary. However, only a small acreage of designated wilderness would be located on BLM-administered lands. The following Wilderness Areas are not managed by the BLM and are not included in the SMA planning area: 240,000 acres of Ventana Wilderness [managed by the U.S. Forest Service] (USFS, 2015), Silver Peak Wilderness [managed by the U.S. Forest Service], and Pinnacles Wilderness [managed by the National Park Service].

Since the passage of Public Law 107-370-(2)(2) on December 19, 2002, the following Wilderness Area and WSAs are recognized within the SMA planning area. The WSAs are currently being managed to preserve their wilderness values according to the BLM Manual 6330 (Management of BLM Wilderness Study Areas), and would continue to be managed in that manner until Congress either designates them as wilderness or releases them for other uses (BLM, 2012). If these areas are released from WSA status by Congress, they would be managed consistent with the rest of the management area and area-wide decisions.

- **Ventana Wilderness.** Congress designated 736 acres of BLM lands as the "Ventana Wilderness Additions" in 2002. This site is contiguous to the Ventana Wilderness Area in the Los Padres National Forest. The BLM-managed Ventana Wilderness encompasses approximately 40 acres in Anastasia canyon, 680 acres surrounding Black Rock Ridge, and 16 acres near Horse Canyon (BLM, 2015g).
- **Bear Mountain WSA.** This 318-acre WSA was determined by the BLM to provide an outstanding opportunity for solitude, and the roadless character of the area provides primitive and unconfined types of recreation. Elevation within the WSA varies from 1,800 to 3,000 feet above sea level. Major vegetation includes pine and oak trees along with chamise (BLM, 2015h).
- **Bear Canyon WSA.** This 3,198-acre WSA was determined by the BLM to provide an outstanding opportunity for solitude, and the roadless character of the area provides primitive and unconfined types of recreation. The WSA is dominated by very steep rugged terrain accentuated by intermittent streams located in the canyon bottoms (BLM, 2015i)
- **Panoche Hills North WSA.** This 6,631-acre area was characterized as unsuitable for wilderness classification. The BLM recommended that this area remain open for oil and gas exploration and development due to the moderate potential for the occurrence of oil and gas reserves in this WSA (BLM, 1988a). However, this WSA will continue to be managed according to BLM Manual 6330 until Congress makes a final determination on its designation.
- **Panoche Hills South WSA.** This 11,305-acre area was characterized as unsuitable for wilderness classification. The BLM recommended that this area remain open for oil and gas exploration and development due to the moderate potential for the occurrence of oil and gas reserves in this WSA (BLM, 1988b). However, this WSA will continue to be managed according to BLM Manual 6330 until Congress makes a final determination on its designation.
- **San Benito WSA.** This WSA was determined unsuitable for wilderness classification due to its insufficient size and previous development within the area (BLM, 1980). In 1971, the BLM designated this WSA as a Natural Area to preserve its botanically unique vegetative communities, and the area was designated as an RNA in 1999 (see San Benito Mountain RNA discussion). This WSA will continue to be managed according to BLM Manual 6330 until Congress makes a final determination on its designation.

Lands with Wilderness Characteristics

The inventory process was conducted by BLM specialists from April 2017 to April 2018. Interdisciplinary resource staff evaluated the information regarding the validity of proposed boundaries of the area(s), the existence of wilderness inventory roads and other boundary features, the size of the area(s), and the presence or absence of wilderness characteristics.

The CCFO has documented the rationale for the findings, and retained a record of the evaluation and the findings as evidence of the BLM's consideration. The results of the inventory are available for public review and are incorporated by reference into this EIS.

To the average visitor who is not familiar with the natural ecosystems [versus human-affected ecosystems], all the units with wilderness characteristics would appear to be affected primarily by the forces of nature this area. A brief description of each unit of public lands with wilderness characteristics, including a map delineating the boundaries of each unit, is provided below and depicted in Figure 3.14-2 [see Appendix A: Maps]. The existing administrative designations, land use allocations, and management actions currently in place for these lands are described below (or under the appropriate resource program areas).

Summary of Results of CCFO LWC Inventory

Total units/acres that satisfied preliminary screening or lands with wilderness characteristics:

■ 29 units = 90,801 acres

Total units/acres determined "yes" units that have wilderness characteristics:

1. CA-090-01 (subunit 15) = 5,355
2. CA-090-03 = 653
3. CA-090-06 = 8,724
4. CA-090-13 (subunit 406) = 5,030
5. CA-090-15 = 21,000
6. CA-090-23 = 2,064
7. CA-090-25 = 236
8. CA-090-26 = 1,726
9. CA-090-28 = 2,477
10. CA-090-29 = 6,999

■ Total Acres: 54,264

■ Total Acres of Federal Mineral Estate: 34,400

Description of Units of Lands with Wilderness Characteristics within Planning Area

1. CA-090-01 (subunit 15) = 5,355 acres (approximately 4,800 acres of Federal mineral estate)

These public lands are located east of Little Panoche Road and north of Panoche Access Road in western Fresno County. The location of CA-090-01 is adjacent to the Panoche Hills North WSA. The topography is shaped by steep incised canyons.

Even though human impacts outside the area are not normally considered in assessing naturalness of an area, there may be effects from major transportation routes and aviation [i.e. flight paths] that contribute to outside impacts on the wilderness characteristics of these lands. Major human uses or activities include auto touring, target shooting, wildflower viewing, hunting, grazing, photography, wildlife studies, biking and hiking.

Although it is a rugged landscape with inhospitable climate in summer, there are outstanding opportunities for solitude in the majority of CA-090-01. The southwest portion of CA-090-01 includes the Panoche-Coalinga Area of Critical Environmental Concern (ACEC), established in 1984 to protect [supplemental] values including a myriad of federally listed (endemic) plant and animal species of the San Joaquin Valley. The far south-southwestern edge of CA-090-01 includes Panoche Plateau which is a long-term research study site for Federally-listed Blunt nosed leopard lizard.

2. CA-090-03 = 653 acres (0 acres of Federal mineral estate)

This unit is bound to the south and west by the Panoche Hills South Wilderness Study Area. The Panoche Hills are noted for their steep, rugged slopes topped by flat plateaus and dissected by deep seasonal drainages and canyons. Hilltops over 2,500 feet high offer scenic vistas of the San Joaquin Valley and spectacular Sierra Nevada Mountains.

There are no major human uses or activities of this area due to its remote and inaccessible location. This unit is part of the Panoche-Coalinga Area of Critical Environmental Concern designated to protect outstanding paleontological resources of the Moreno shale formation. The Moreno shale formation contains outstanding paleontological resources including marine vertebrates (mosasaurs, plesiosaurs, and sea turtles) and scientifically significant plant fossils including leaf impressions and fossilized wood.

3. CA-090-06 = 8,724 acres (approximately 8,700 acres of Federal mineral estate)

This unit, known as the Griswold Hills, is near the Vallecitos oil field in southern San Benito County. The area is publicly accessible from the BLM's Griswold Hills recreation site off New Idria Road. Primary recreational uses include hunting (California quail and chukar) and target shooting. Although there are human-caused modifications including water troughs, water tanks, livestock fences, and dirt roads, these are all largely screened by vegetation and landscape. The remoteness, rugged topography, and exceptional views of the surrounding landscape provide outstanding opportunity for solitude.

4. CA-090-13 (subunit 406) = 5,030 acres (approximately 1,500 acres of Federal mineral estate)

This unit is located in the southern Ciervo Hills of western Fresno County and is bisected by Arroyo Hondo (seasonal drainage). Major human uses include livestock grazing (cattle), hunting, target shooting, and camping. Cattle are common year-round on the southern portion of CA-090-13 near Borreguero Spring where there is a water well, tanks, water troughs, and a corral. The few man-made features on the landscape including water troughs, tanks, and corral area are largely screened by vegetation and landscape. Outstanding opportunities for solitude would be possible within the rugged, secluded landscape if public access becomes feasible.

A portion of the unit is within the Panoche-Coalinga Area of Critical Environmental Concern (ACEC). The ACEC was established to protect endangered animal species and their associated habitats, such as the San Joaquin kit fox and Giant kangaroo rat, which are present on CA-090-13.

5. CA-090-15 = 21,000 acres (approximately 10,200 acres Federal mineral estate)

This unit comprises the largest remaining roadless area in the region on the west side of Fresno County. It extends along the eastern slope of the southern Diablo Mountain range from Cantua Creek south to Joaquin Ridge. This unit includes the 7,400-acre Joaquin Rocks Area of Critical Environmental Concern (ACEC) established to protect cultural, historic, and biological resource values.

The topography is very rugged and very steep. Major human uses and activities include hunting, target shooting, mountain biking, hiking, camping, rock climbing, and star gazing. The area was proposed for wilderness designation in numerous legislative sessions sponsored by local U.S. Congressional representatives from 2014 to 2016.

This unit contains outstanding opportunities for solitude. The area is remote and retains a wild, untamed character. There are exceptional views of the San Joaquin Valley and Sierra Nevadas from high points including Loma Atravesada and Joaquin Rocks. Some man-made features are visible on Santa Rita Peak and Black Mountain, but they don't detract from the solitude. The Joaquin Rocks ACEC is a place of outstanding geological, scenic, and historical value. The sandstone monoliths composing Joaquin Rocks ("Three Rocks") are a local landmark visible from the San Joaquin Valley floor. The Rocks are also an important Native American cultural site.

6. CA-090-23 = 2,064 acres (0 acres of Federal mineral estate)

This unit is located in western Fresno County adjacent to unit CA-090-15, which delineates the proposed Joaquin Rocks wilderness area. The unit is bounded by Borreguero Spring on the northern boundary and Cantua Creek on the southern boundary. The topography is steep and hilly. Major uses include livestock grazing (cattle), hunting, target shooting, and camping.

Cattle are common year-round on the open grassland areas of the western portion of CA-090-23. Improvements to springs including cattle water troughs and water diversion for a hunting cabin operated by adjacent landowners are present on CA-090-23. The area has outstanding opportunities for solitude. It is remote and mostly retains its natural, wild, rugged, untamed character.

A portion of the unit is within the Panoche-Coalinga Area of Critical Environmental Concern (ACEC). The ACEC was established to protect endangered animal species and their associated habitats, such as the San Joaquin kit fox, which are present on the unit. Additionally CA-090-23 contains extensive vertic clay soil derived from the Moreno Shale formation that support numerous rare, local endemic, annual plant species that produce exceptional wildflower displays in good rain years.

7. CA-090-25 = 236 acres (0 acres of Federal mineral estate)

This unit is located in western Fresno County adjacent to unit CA-090-15, which delineates the proposed Joaquin Rocks wilderness area. The unit is in the Cantua Creek drainage on a south facing hillside. Major uses include livestock grazing (cattle), hunting, target shooting, and camping.

8. CA-090-26 = 1,726 acres (approximately 1,200 acres of Federal mineral estate)

This unit is located in western Fresno County adjacent to unit CA-090-15, which delineates the proposed Joaquin Rocks wilderness area. The northern boundary is a combination of the property lines between BLM land and private land and an unnamed dirt road. The western and southwestern boundaries consist of an irregular line from near New Idria to Cantua Azul. The primary access road to the area is located along the northern boundary. A spur road departs from the primary access road through CA-090-26 to a cabin on the private land to the NE of San Carlos Peak. This road is maintained by the private land owner. An ATV trail departs from the primary access road near the center of CA-090-26 and travels approximately 1 mile to the SE through CA-090-26. The ATV trail is used several times a year to manage livestock grazing operations. Other uses include hunting and hiking. The area has outstanding opportunities for solitude in the rugged, remote landscape. The few man-made features in the landscape including a few dirt roads and a cabin on the private lands are largely screened by vegetation and the landscape such that they do not reduce the area's degree of apparent naturalness.

9. CA-090-28 = 2,477 acres (approximately 1,200 acres of Federal mineral estate)

This unit straddles Joaquin Ridge north-south between Arroyo Leona and Pine Canyon. The boundary extends east from Clear Creek Management Area to the headwaters of the Arroyo Leona watershed. Major uses include livestock grazing (cattle), hunting, hiking, and mountain biking. The landscape is rugged and secluded. Although the area is bisected by the by the road to Joaquin Rocks (BLM route R11), the road does not reduce the area's degree of apparent naturalness. Likewise, the Butler Estate Chromite Mine which

is visible from Joaquin Ridge Road is largely screened by vegetation and landscape on the rest of the area and does not reduce the area's naturalness.

CA-090-28 has outstanding opportunities for solitude, and recreation, in combination with CA-090-24 and CA-090-15 (Joaquin Rocks proposed wilderness) and other units extending out towards San Carlos Bolsa.

10. CA-090-29 = 6,999 acres (approximately 6,800 acres of Federal mineral estate)

This unit, known as the Coalinga Mineral Springs, is approximately 18 miles west of Coalinga, CA on the southern end of the Diablo Mountain range. This unit ranges in elevation from approximately 2,080 feet to 3,500 feet along Juniper Ridge. The terrain is a series of rugged, steep ridges separated by steep canyons cut by seasonal drainages. The Coalinga Mineral Springs National Recreational Trail (NRT) is a prominent feature in this unit. Hiking the 5.5 round-miles of the NRT to Kreyenhagen Peak provides virtually unobstructed views of the Southern Diablo range and the San Joaquin Valley.

Major uses include, but are not limited to hiking, hunting, wildlife viewing, horseback riding, photography, and mountain biking. Recent wildfire has resulted in several bulldozed fire breaks in the area. However, these temporary features do not reduce the area's degree of apparent naturalness.

3.14.4 Current Conditions and Trends

Central Coast Field Office Planning Area

Since adoption of the 2007 HFO RMP, specific SMAs have been open to oil and gas leasing (e.g., Panoche-Coalinga ACEC). However, restrictions such as NSO stipulations and an endangered species stipulation currently apply to any leases permitted within an ACEC, as described in Appendix D of the 2007 HFO RMP (BLM, 2007). SMAs that are closed to oil and gas leasing per the 2007 HFO RMP include designated Wilderness Areas, WSAs, and Fort Ord (BLM, 2007). The following is a discussion of the management of SMAs in regard to current oil and gas development within the planning area.

National Monuments

The Fort Ord National Monument and the California Coastal National Monument are closed to oil and gas leasing per Presidential Proclamations 7264 and 8804, which state:

> *All Federal lands and interests in lands within the boundaries of this monument are hereby appropriated and withdrawn from all forms of entry, location, selection, sale, leasing, or other disposition under the public lands laws, including withdrawal from location, entry, and patent under the mining laws, and from disposition under all laws relating to mineral and geothermal leasing other than by exchange that furthers the protective purposes of the monument.*

Specific guidance in existing BLM management plans (e.g., California Coastal National Monument RMP) further identify resource protections and restricted uses that are applicable to its management area, as described in Section 3.14.2.

National Trails

The Juan Bautista de Anza National Historic Trail meanders across Federal, State, and private land within and beyond the BLM's CCFO Planning Area boundary. The trail traverses a total of 4.8 miles of split estate land, and would not cross BLM-administered surface estate. None of the existing trail is located within active oil and gas fields.

Coalinga Mineral Springs National Recreation Trail is located within an area of Federal mineral estate, approximately 7 miles west of active oil and gas fields.

Areas of Critical Environmental Concern and Research Natural Areas

Oil and gas leasing has taken place within existing ACECs in the planning area. Table 3.14-1 lists the oil and gas leases within each ACEC and RNA, as well as the number of existing wells in order to provide a measure of oil and gas activity in that area.

Table 3.14-1. Existing Leases and Wells within Central Coast Field Office ACECs and RNAs

ACEC or RNA	Total within ACEC or RNA		Total Acreage of Leases within ACEC or RNA
	Leases	Wells	
Clear Creek Serpentine ACEC	1	0	116
Panoche-Coalinga ACEC	40	130	9,534
Joaquin Rocks ACEC	0	0	0
Monvero Dunes RNA	0	0	0
San Benito Mountain RNA	0	0	0

Wilderness and Wilderness Study Areas

Wilderness Areas and WSAs are closed to oil and gas leasing per the Wilderness Act of 1964 and BLM Manual 6330 (Management of BLM Wilderness Study Areas). As described in Section 3.14.2, only Congress can designate the WSAs established under Section 603 of FLPMA as wilderness or release them for other uses. The status of the existing WSAs and the management guidance for these areas would not change as a result of this RMPA/EIS.

Leases Subject to Settlement Agreement

The proposed 14 non-NSO leases are located in San Benito and Monterey Counties within the CCFO Planning Area boundary. In San Benito County, eight lease sites (Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828) would be approximately 2.5 miles north of San Benito Mountain RNA and 5.6 miles south of the Panoche Hills South WSA. In Monterey County, 6 lease sites (Leases CACA 052960, 052959, 053825, 053824, 053827, and 053826) would be located across a range of approximately 14 miles to 34 miles southeast of Bear Canyon WSA, which would be the nearest SMA to these leases. None of the 14 leases subject to the settlement agreement include lands with wilderness characteristics (refer to Figure 3.14-2 in Appendix A).

3.15 Cultural and Heritage Resources

3.15.1 Introduction

Cultural resources are locations of human activity, occupation, or use. They are expressions of human behavior in the physical environment, such as pre-European contact Native American archeological sites or historic period buildings, structures, objects, or other places. Cultural resources can also be natural features that are considered important to a group, sub-culture, or community. Some of these resources may be determined eligible to the National Register of Historic Places (NRHP) per the National Historic Preservation Act (NHPA).

3.15.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/EIS), refer to Appendix J.

3.15.3 Regional Setting

The CCFO Planning Area is located in west-central California and encompasses all or part of 12 counties extending southward from Contra Costa, San Francisco, and San Joaquin Counties in the north to Monterey, San Benito, and Fresno Counties in the south.

Archeological Resources

The diverse land area managed by the CCFO encompasses a vast, resource-rich portion of central California containing many hundreds of prehistoric archaeological sites reflecting an occupation of more than 6,000 years and a diversity of site types throughout the interior as well as along the coast. While it is likely that the CCFO Planning Area and the greater Central Valley have been populated for approximately 12,000 years, very few archeological sites have been found that date before 7,000 years ago. The evidence for early human use is likely deeply buried in the valley alluvial sediments that accumulated rapidly during the later Holocene epoch. Moratto (1984 from BLM, 2006) estimates an accumulation of up to 10 meters of sediments in the lower reaches of the Sacramento River drainage during the last 5,000 to 6,000 years.

As of 1984, approximately 6,000 acres of public lands were inventoried to a BLM "Class III" level (e.g., complete survey coverage of a given area), covering approximately 2 percent of the total Decision Area at that time. Ninety sites were recorded in at least two Management Areas, 53 of which were found potentially eligible for listing in the National Register of Historic Places. Locational data are available but are contained on confidential, individual archaeological site records. Sites were identified from the late prehistoric period, the ethnographic period, and the historic period. Prehistoric sites include small and large occupation sites with midden, temporary camp sites, rock shelters, rock art/ceremonial sites, bedrock mortar outcrops (BRMs), and lithic scatters. Archaeological excavations within the CCFO Planning Area have been few thus contributing very little to the knowledge of the prehistoric period.

From 1984 to 2006, approximately 451 additional archaeological sites had been recorded throughout the four management areas of the CCFO. Only a few sites have been evaluated, and most are assumed eligible for the National Register until they are formally evaluated. Moreover, the CCFO's BLM lands exchange program was able to inventory approximately 86,000 acres for cultural resources, with negative findings on nearly 53,000 acres. The presence of cultural resources on the remaining 33,000 acres resulted in the BLM retaining approximately 1,340 acres of the proposed exchange land specifically because of its high cultural resource value. Pre-contact archaeological resources withheld from exchange included a prehistoric midden site containing human remains. The number of sites in these 1,340 acres is unknown but the general understanding of these high cultural resource value has been considered for the RMP and lease issuance. Site-specific surveys are required at the development stage (e.g. APD).

Tribal Groups

Native California Indian tribal groups within the Planning Area include the Northern and Southern Valley Yokuts, Salinan, Esselen, Costanoan/Ohlone, and Bay Miwok (BLM, 2006). Although no federally recognized tribes are based within the CCFO Planning Area boundary, the CCFO consults with the Tachi Yokuts Tribe of Santa Rosa Rancheria as undertakings or proposals have the potential to affect their ancestral lands. Several non-federally recognized tribes, groups, and individuals have associations to the area, and the CCFO consults with these groups/individuals as BLM policy dictates.

3.15.4 Current Conditions and Trends

To aid in the identification of current issues and concerns regarding cultural resources in the CCFO Planning Area, letters were sent to the following government agencies and historical societies:

- California Historical Society
- Pacific Railroad Society
- Alameda County Historical Society
- Livermore Heritage Guild
- Contra Costa County Historical Society
- Clayton Historical Society
- Concord Historical Society
- Fresno City and County Historical Society
- R.C. Baker Memorial Museum, Inc.
- Monterey County Historical Society
- Boronda Adobe History Center
- Big Sur Historical Society
- San Benito County Historical Society
- San Juan Bautista Historical Society
- San Mateo County History Museum
- The Museums of Los Gatos
- Morgan Hill Historical Society
- San Lorenzo Valley Museum
- Scotts Valley Historical Society
- Pajaro Valley Historical Association
- Alameda County, Planning Department
- Contra Costa County, Department of Conservation and Development
- Fresno County, Department of Public Works and Planning
- County of Madera, Building Division
- Merced County, Planning Department
- Monterey County, Planning Department
- San Benito County, Planning, Building Inspection Services, and Code Enforcement Department
- City and County of San Francisco, Planning Department
- San Joaquin County, Community Development Department
- San Mateo County, Department of Planning and Building
- Santa Clara County, Department of Planning and Development
- Santa Cruz County, Planning Department
- Stanislaus County, Planning and Community Development

Other sources consulted include the list of nominated historic properties in the National Register of Historic Places maintained by the California Office of Historic Preservation. Also a review of BLM records for the CCFO Planning Area and interviews with key staff were conducted. The purpose of the CCFO visit was

to perform an information search for any cultural, paleontological, and built environment resources the Field Office had for surface and split-estate BLM lands within the Planning Area. All recent BLM cultural investigation reports for surface lands were reviewed in digital and/or hard copy form. The results of this research informed the following discussion of expected historical property types.

Since very few cultural resource investigations have occurred on BLM surface lands since 2009, 10 split estate areas were targeted for a California Historic Resources Information System (CHRIS) data search. Descriptions of the targeted split-estate lands were submitted to the Northwest Information Center at Sonoma State as well as the Southern San Joaquin Valley Information Center at CSU Bakersfield. Results of the CHRIS and BLM reviews within the CCFO Planning Area are provided below, organized by county. Included are results from the CHRIS searches by submitted map as well as reports and resources received from BLM.

Contra Costa County

A CHRIS records search conducted for a 575-acre parcel resulted in no known archaeological sites or investigations within the search area).

Monterey County

A CHRIS records search for a 795-acre parcel identified three previous investigations within the search area. One investigation, a field reconnaissance of less than an acre of land in Big Sur, was negative for prehistoric and historic resources (Doane and Breschini, 2008). The second investigation involved a survey after a wild fire on national wilderness and state park lands in the Big Sur area in 2008. No cultural resources were described or mapped during the investigation (Dallas, 2008). The third investigation involved a field survey of less than an acre of land in Big Sur California for the replacement of a cattle guard. Results were negative for prehistoric and historic resources (Doane and Breschini, 2014).

A second CHRIS records search for a 1,550-acre parcel identified one previous investigation of approximately 160 acres in Rancho San Lucas with negative results for prehistoric and historic resources (Smith and Breschini, 1989).

A third CHRIS records search for a 2,820-acre parcel resulted in no known archaeological sites or investigations within the search area.

In 2008, the Central Coast Field Office performed environmental assessments of 80 acres of public land in the Copperhead 1 and 2 areas and 40 acres of public land in the Portuguese Canyon area to assess the land for eligibility for public sale; no archeological or cultural resources were identified within the parcels (BLM, 2008).

Fresno County

A CHRIS records search for a 2,210-acre parcel identified recorded resources including one prehistoric temporary campsite with bedrock mortars and two discrete lithic scatters (CA-FRE-2523). No cultural resource investigations had been conducted within the search area.

Santa Clara County

A CHRIS records search conducted for a 1,310-acre parcel identified one previous investigation consisting of background research and a field survey of a road alignment area to be constructed identified no cultural resources within the investigation area (Busby, 2003). A second CHRIS records search for a 575-acre parcel revealed one previous investigation, a cultural resources evaluation including archival research and a survey of 4 acres, that found no cultural resources (Cartier, 2005).

To assess the eligibility of public land parcels for sale, the BLM conducted environmental assessments of 9.21 acres in the Loma Prieta area, 65.65 acres in the Upper Uvas area, 40 acres in the Waterman Creek area, 15.97 acres in the Pacheco Peak area, and 23.60 acres in the Uvas Creek area; the five assessments resulted in negative findings for significant cultural resources (BLM, 2008).

San Benito County

A CHRIS records search for a 1,460-acre parcel revealed one previous investigation which was a mixed strategy reconnaissance of approximately 2,000 acres in Monterey, San Benito, and Fresno Counties (Breschini and Haversat, 1991). Results were negative for prehistoric and historic resources within the current search area (see Map 5). A second CHRIS records search for a 1,120-acre parcel also resulted in no known archaeological sites or investigations within the search area.

In 2008, the Central Coast Field Office performed an environmental assessment of: 15.61 acres of public land in the San Benito River area to assess the land for eligibility for public sale; no archeological or cultural resources were identified within the parcel (BLM, 2008).

BLM records indicate one large scale archaeological reconnaissance investigation was performed on approximately 11,000 acres, 420 acres of which are BLM-administered surface lands. The inventory was to identify cultural resource locations which could be affected by drilling associated with seismic testing as part of the 3D Seismic Testing project in the Vallecitos area. Findings included two prehistoric sites, one historic residence with related machinery, and one historic isolate. One previously recorded prehistoric archaeological site (CA-SBN-128) and one previously recorded historic site (CA-SBN, 248H) were relocated (Jackson and Armstrong, 2008).

Santa Cruz County

An environmental assessment of 12.55 acres of public land by BLM in the Ramsey Gulch area to assess the eligibility of land for public sale revealed no known archeological or cultural resources within the parcel (BLM, 2008).

San Mateo County

A CHRIS records search for a 375-acre parcel identified two previous investigations within the search area. One investigation was an archaeological evaluation and assessment of a shell midden site referred to as the Redwood Chiton site, located within the Santa Cruz Mountains. The site was recommended significant (Dillon, 1992). The second investigation was an archaeological survey of 90 acres in San Mateo County resulting in no cultural resources being found (Reynolds, 2004).

An environmental assessment of 40 acres of public land by BLM in the Butano Creek area to assess the land for eligibility for public sale indicated a negative occurrence of cultural resources.

Leases Subject to Settlement Agreement

The records search did not identify resources specifically located on the 14 parcels subject to the Settlement Agreement. Therefore, the tendencies to contain resources are subsumed in the discussion of the Planning Area in general. Leases CACA 052960, 052959, 053825, 053824, 053827, and 053826 are located in Monterey County and Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828 are located in San Benito County.

3.16 Paleontological Resources

As described in the Bureau of Land Management's (BLM's) Manual and Handbook H-8270-1, General Procedural Guidance for Paleontological Resource Management (BLM, 1998a, 1998b, 2007, 2008), the BLM's objectives for paleontological resource management is to manage scientific, educational, and recreational values, and to mitigate adverse impacts.

3.16.1 Introduction

Paleontology is a multidisciplinary science that combines elements of biology, geology, chemistry, and physics in an effort to understand the history of life on earth. Paleontological resources, or fossils, are the evidence of once-living organisms preserved in the geologic record. They include the fossilized remains of the organisms themselves as well as traces which may include trackways, imprints, and burrows. Fossils are typically preserved in sedimentary rocks, although some fossils can also be preserved in volcanic rocks and low-grade metamorphic rocks under certain conditions. Paleontological resources can provide important taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, or biochronological data (Scott and Springer, 2003, 6:8).

Significance Criteria

Emphasis for evaluation of the significance of fossils is placed on uniqueness and scientific value, whether fossils are in stratigraphic context that contribute to the body of paleontological knowledge, and whether fossil occurrences may individually have low significance, but contribute individually or collectively to the body of data that allows resource management and resource preservation. Additionally, the public benefits and public expectations arising from a fossil's scientific, recreational, and educational values are evaluated (BLM, 2007, 3.14-1).

Potential Fossil Yield Classification (PFYC)

Geologic units are considered to be "sensitive" if they are known to contain scientifically important paleontological resources anywhere in their extent. The area of sensitivity is typically defined as the entire rock unit (formation or member thereof) and not limited to areas where surface fossils may be exposed. Using baseline information gathered during a paleontological resource assessment, the sensitivity of the geologic unit(s) underlying a project area can be assigned to one of several categories defined by the BLM (2016) as very high (Class 5), high (Class 4), moderate (Class 3), low (Class 2), and very low (Class 1), unknown (Class U), water (Class W), and ice (Class I) potential for fossilized remains. This PFYC system was adopted after the original analyses for this EIS with the last three categories added.

Management concerns for paleontological resources within geologic units designated PFYC Class 1 or PFYC Class 2 is generally low or negligible. Therefore, consistent with the purpose of this RMPA/EIS, only those geologic units with sufficient management concern and the potential to yield scientifically important fossils are described in this analysis (i.e., PFYC Classes 3, 4, 5). The analyses reported herein predate the BLM (2016) PFYC system; therefore, geologic units with Class U PFYC potential, if any, are not addressed explicitly. Geologic units ranked as Class U, if any, would be treated as having medium to high management concerns per BLM (2016).

3.16.2 Regulatory Framework

Paleontological resources (i.e., fossils) are considered non-renewable scientific natural resources; because once when destroyed, they cannot be replaced. As such, paleontological resources are afforded protection under the various Federal, State, and local laws and regulations, which are discussed in Appendix J.

3.16.3 Regional Setting

The CCFO Planning Area is situated within the Coast Ranges and Great Valley (i.e., Central Valley) geomorphic provinces of California. The geology of the Coast Ranges and Central Valley is exceptionally diverse, and although their geomorphology is distinctly different, the two provinces share a common geologic history.

3.16.4 Current Conditions and Trends

Geology and Paleontology of the Major Fossil-Bearing Units in the Central Coast Field Office Planning Area

The major significant fossil-bearing units underlying the CCFO Planning Area are listed below in Table 3.16-1 (Graymer, et al., 1996; Jennings, 1958; Jennings and Strand, 1958; Koenig, 1963; Strand and Koenig, 1965; University of California Museum of Paleontology [UCMP], 2015). Since BLM guidance for the PFYC system (BLM, 2016) changed after the original analyses for this document, only PFYC classes 3-5 are addressed below in Table 3.16-1 and geologic units with Class U potential are excluded, if any occur in the CCFO Planning Area. For all geologic units in Table 3.16-1, the highest PFYC category is assigned for any with a range of potential rankings. Geologic units are listed chronologically oldest to youngest in Table 3.16-1.

Table 3.16-1. Major Fossil-Bearing Units in the Central Coast Field Office Planning Area

Geologic Unit	Age	Typical Fossils	Preliminary[1] Potential Fossil Yield Classification
Franciscan Assemblage	Jurassic to Cretaceous	Reptile, invertebrate, plant	PFYC 3a
Panoche Formation (Great Valley Sequence)	Cretaceous	Reptile, invertebrate, plant	PFYC 4
Moreno Formation (Great Valley Sequence)	Cretaceous	Reptile, shark, fish, invertebrate, plant	PFYC 5
Laguna Seca Formation[2]	Late Paleocene to Early Eocene	Invertebrate, plant	PFYC 2*
Martinez Formation	Paleocene to Eocene	Vertebrate, invertebrate	PFYC 4
Lodo Formation	Late Paleocene to Early Eocene	Vertebrate, invertebrate, microfossil	PFYC 4
Domengine Formation	Middle Eocene	Shark, fish, invertebrate, microfossil	PFYC 3a
Avenal Sandstone	Early to Middle Eocene	Vertebrate, invertebrate, microfossil	PFYC 3a
Kreyenhagen Formation (including the Tumey Sandstone)	Eocene	Vertebrate, invertebrate, microfossil, plant	PFYC 5
Markley Formation	Late Eocene	Fish, invertebrate, microfossil	PFYC 4
Temblor Formation	Oligocene to Early Miocene	Marine mammal, terrestrial mammal, shark, bony fish, invertebrate, plant	PFYC 5
Vaqueros Formation	Early Miocene	Marine mammal, terrestrial mammal, shark, invertebrate	PFYC 5
Lompico Formation	Middle Miocene	Vertebrate, invertebrate	PFYC 3a
Monterey Group	Middle to Late Miocene	Marine mammal, terrestrial mammal, shark, bony fish, plant, microfossil	PFYC 5
Briones Formation (San Pablo Group)	Late Miocene	Large land mammals, reptile, fish, birds, sharks, invertebrates	PFYC 4

Table 3.16-1. Major Fossil-Bearing Units in the Central Coast Field Office Planning Area

Geologic Unit	Age	Typical Fossils	Preliminary[1] Potential Fossil Yield Classification
Cierbo Formation (San Pablo Group)	Late Miocene	Vertebrate, invertebrate	PFYC 3a
Neroly Sandstone (San Pablo Group)	Late Miocene	Vertebrate: beaver, deer, rodent, horse; invertebrate	PFYC 4
Oro Loma Formation	Late Miocene to Pliocene	Terrestrial mammal	PFYC 4
Santa Margarita Formation	Late Miocene	Marine mammal, terrestrial mammal, shark, bony fish, plant, bird, invertebrate	PFYC 5
Santa Cruz Mudstone	Late Miocene	Shark, fish, invertebrate, microfossil	PFYC 4
Jacalitos Formation	Miocene to Pliocene	Vertebrate, invertebrate, microfossil	PFYC 4
Purisima Formation	Early to Middle Pliocene	Vertebrate, invertebrate, microfossil	PFYC 5
Tehama Formation	Pliocene	Land mammal, fish, rodent	PFYC 3a
Etchegoin Formation	Pliocene	Vertebrate, invertebrate, microfossil	PFYC 5
San Benito Gravels	Pliocene to Pleistocene	Vertebrate	PFYC 4
Irvington Gravels	Pliocene to Pleistocene	Vertebrate, invertebrate	PFYC 5
Livermore Gravels	Pliocene to Pleistocene	Vertebrate	PFYC 3a
Paso Robles Formation	Late Pliocene to Early Pleistocene	Vertebrate, invertebrate	PFYC 4
Tulare Formation	Late Pliocene to Early Pleistocene	Mammal, bird, shark, fish, plant	PFYC 4
Merced Formation	Pleistocene	Mammal, bird, shark, fish, invertebrate, microfossil, plant	PFYC 5
Quaternary Older Alluvium	Pleistocene	Vertebrate	PFYC 3a

Sources: BLM, 2007; Graymer et al., 1996; Jennings, 1958; Jennings and Strand, 1958; Koenig, 1963; Strand and Koenig, 1965
*Denotes low sensitivity; see Note 2.
1 - PFYC recommendation for this RMPA/EIS is preliminary and programmatic. During subsequent site-specific project-level evaluations, these PFYC recommendations may be refined based on local conditions (BLM, 2016).
2 - Although the Laguna Seca Formation has no record of vertebrate localities in the UCMP or Paleobiology databases, the BLM (2007, 3.14-5) assigned a moderate to high sensitivity to the unit (Condition 2) on the basis of Staebler (Survey of the Fossil Resources in the Panoche and Ciervo Hills of Western Fresno County, California;1981 [unpublished]). Therefore, in accordance with the BLM (2016), this unit has been assigned a PFYC 4.

New Paleontological Resources Identified in the Central Coast Field Office Planning Area Since 2007

The 2007 Hollister Field Office Proposed RMP/Final EIS described the existing paleontological resources in the CCFO Planning Area and summarized important discoveries since 1937, when a nearly complete skeleton of a plesiosaur was recovered from the Moreno Formation (BLM, 2007, 3.14-2). Subsequent to that discovery, hundreds of localities within the CCFO Planning Area are associated with a diverse flora and fauna that spans the Upper Cretaceous through the Pleistocene Epochs. Most notably, the Upper Cretaceous Moreno Formation, Eocene Kreyenhagen Formation (including the Tumey Sandstone member), and Early Miocene Temblor Formation have been especially fossiliferous and have yielded thousands of vertebrate, invertebrate, microfossil, and plant specimens.

Since 2007, several additional significant fossil resources have been recovered from the CCFO Planning Area. During the 2008–2010 field seasons, BLM Natural Resource Specialist Ryan O'Dell along with Conservation and Land Management interns conducted intensive field surveys of Moreno Shale formation exposures in the Panoche Hills and Tumey Hills in order to document and map fossils within this unit. Hundreds of localities for fossilized plant materials were documented, as well as several localities for marine vertebrate fossils. The most significant fossilized plant materials documented included a single large-diameter fossilized log, other smaller fossilized logs, concentrations of fossilized wood including palm wood, and concentrations of fossilized foliated Moreno conifer (*Margeriella cretacea*) branch fragments. Significant vertebrate fossil discoveries included a partial specimen of sea turtle and a partial specimen of an *Elasmosaurus* excavated in 2010–2011. Additionally, two partial plesiosaur specimens were excavated - one by Dr. Robert Dundas, CSU Fresno, and one by Chad Staebler (BLM, 2010).

In 2009, A team of students from the Webb School, led by Don Lofgren from the Raymond Alf Museum, returned to the Path 15 sites within the Temblor Formation to conduct the first excavation since it was originally discovered in 2004 (BLM, 2010). They also collected sediments to wash for the presence of microfossils (BLM, 2010). Their efforts yielded macroscopic mammal bone fragments and thousands of gastropods through screen washing and picking including *Menetus micromphalus, Planorbula mojavensis, Hawaiia minuscula*, and *Lymnaea mohaveana* (Lofgren, Personal communication, 2011).

An early Holocene age fossil-bearing oil seep deposit was discovered in 2015 in Oil Canyon north of Coalinga by Ryan O'Dell (UCMP PA1340; O'Dell et al., 2017). The deposit consists of stratified alluvium (sand) and decomposed oil and tar containing abundant terrestrial plant materials and impressions, abundant insect impressions, and limited vertebrate fossils. Subsequent excavations yielded specimens of Aves (bird), Squamata (scaled reptile), *Quercus* x *alvordiana* (Alvord oak), *Eriogonum nudum* var. *indictum* (wild buck-wheat), *Typha* (cattail), and Poaceae (grass), as well as abundant insects (Odonata, Lepidoptera, Coleoptera, Orthoptera). All specimens were deposited at UCMP.

The CCFO Planning Area is known for an abundance of significant flora and fauna representing extinct ecosystems unique to north-central coastal California. The Moreno Shale Formation is a world-class locality for Cretaceous vertebrate fossils, including museum-quality specimens that reside at the Natural History Museum of Los Angeles County (NHMLAC). It is one of the few localities for Cretaceous large marine reptiles in North America and one of the few localities that has yielded dinosaur fossils in California. The Oil Canyon fossil locality is only one of only four significant fossiliferous oil seep deposits in California, which also include the McKittrick, Carpinteria, and La Brea localities. Because of the abundance, quality, and scientific value of fossil material recovered from within the CCFO Planning Area, it is highly likely that significant paleontological resources will be discovered here in the future.

Leases Subject to Settlement Agreement

Table 3.16-2 lists the geologic units underlying each of the 14 Leases Subject to Settlement Agreement, see Table 3.16-1 for a description of each geologic unit.

Table 3.16-2. Major Fossil-Bearing Units within the Leases Subject to Settlement Agreement

Leases Subject to Settlement Agreement		Geologic Unit(s)
1	CACA 052959	Monterey Group
2	CACA 052960	Monterey Group, Paso Robles Formation
3	CACA 053824	Monterey Group
4	CACA 053825	Monterey Group
5	CACA 053826	Monterey Group
6	CACA 053827	Monterey Group, Paso Robles Formation

Table 3.16-2. Major Fossil-Bearing Units within the Leases Subject to Settlement Agreement

Leases Subject to Settlement Agreement		Geologic Unit(s)
7	CACA 053828	Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Monterey Group, and Oro Loma Formation
8	CACA 053829	Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, and Monterey Group
9	CACA 053830	Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Monterey Group, and Oro Loma Formation
10	CACA 053831	Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Monterey Group, and Oro Loma Formation
11	CACA 053832	Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, and Monterey Group
12	CACA 053833	Laguna Seca Formation, Martinez Formation, and Lodo Formation
13	CACA 053834	Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, and Kreyenhagen Formation
14	CACA 053835	Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Monterey Group, Oro Loma Formation, and Quaternary Older Alluvium

Sources: Dibblee and Minch, 2006, 2007a, 2007b; Graymer et al., 1996; Jennings, 1958; Jennings and Strand, 1958; Koenig, 1963; Strand and Koenig, 1965.

3.17 Social and Economic Conditions

3.17.1 Introduction

This chapter describes the laws and regulations that govern social and economic issues at a Federal level, including environmental justice. It should be noted that U.S. Bureau of Land Management (BLM) oil and gas management actions (e.g., lease stipulations or areas closed to leasing) affect the social and economic environment outside of lands solely under jurisdiction of the BLM. This is because the social and economic effects of an action like oil and gas development on lands under jurisdiction of the BLM can extend to populations and communities located outside BLM surface lands. Additionally, where Federal mineral estate occurs under private lands, social and economic factors related to oil and gas developments within the Central Coast Field Office (CCFO) Planning Area extend to populations and communities located outside BLM surface lands. Therefore, this section summarizes the existing environment regarding socioeconomics of the oil and gas industry and environmental justice (including data on existing minority and low-income communities) for each county contained within the CCFO Planning Area boundary.

3.17.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/EIS), refer to Appendix J.

3.17.3 Regional Setting

This section summarizes existing social and economic conditions within the CCFO Planning Area. The CCFO Planning Area boundary contains twelve California counties:

- Alameda
- Contra Costa
- Fresno
- Merced
- Monterey
- San Benito
- San Francisco
- San Joaquin
- San Mateo
- Santa Clara
- Santa Cruz
- Stanislaus

This section includes programmatic summaries of socioeconomic conditions for areas both inside and outside BLM surface lands within the CCFO Planning Area boundary. Areas outside BLM surface lands are included because social and economic factors related to oil and gas developments on BLM-administered lands within the CCFO Planning Area extend to population and communities located outside BLM surface lands. Therefore, the NEPA "affected environment" includes the overall socioeconomic conditions of communities affected by activities on BLM surface lands or by BLM management decisions. This section uses available data to establish the existing socioeconomic resource conditions in environmental justice populations at a programmatic level.

In presenting existing conditions of socioeconomic resources and environmental justice populations, unique considerations create differing "study area" boundaries. For example, a regional study area may include an entire county or larger metropolitan area. Meanwhile, a local study area may include communities proximate to an existing oil and gas field where employees and support businesses likely reside. Where applicable, in describing the social and economic conditions, study areas are defined and representative qualitative and quantitative data are presented.

Social Demographic Setting

Table 3.17-1 summarizes current and forecasted population trends, current minority and low-income population percentages, current housing data, and average household size and income statistics for all 12 counties within the CCFO Planning Area boundary. As shown, population growth between 7 and 15 percent is forecasted for all 12 counties. Alameda County and Santa Clara County provide the greatest

number of housing units within the CCFO Planning Area. Merced County has both the highest housing vacancy rate and also the lowest median home price. Housing data is important when considering socio-economics as changes in social structure of a community directly influence the housing market. Furthermore, proposed developments (particularly those expected to generate a specified number of low-wage jobs) can impact the community's current housing market and demand for more affordable housing. As expected, Bay Area counties have the highest median home values and household incomes.

Environmental Justice Demographics

For this analysis, an environmental justice low-income population is identified when the percentage of low-income population of the potentially affected area is equal to or greater than the low-income population of the greater geography. Because this programmatic analysis includes twelve California counties, the baseline (greater geography) low-income percentage for county comparison is that of California. To ensure a more regional robust comparison is also completed for environmental justice, each county within the CCFO Planning Area is compared against one another. For local communities (Section 3.17.4.2), the baseline (greater geography) low-income percentage for comparison is that of the county in which they are located within.

Regional Study Area Minority and Low-Income Populations

With respect to environmental justice and minority populations, Table 3.17-1 shows that only Santa Cruz County is not considered to have a minority population of concern (40.2%) within the CCFO Planning Area boundary. All remaining counties within the CCFO Planning Area contain a minority population exceeding 50% and significantly greater compared the lowest percentages of minority population within the CCFO Planning Area boundary, with Merced County containing the highest (68.2%).

With respect to environmental justice and low-income populations, California contains an overall low-income percentage of 15.9% (U.S. Census, 2015). Considering this, Fresno, Merced, Monterey, San Joaquin, and Stanislaus Counties have a percentage of low-income population greater than that for California as a whole. These are considered low-income areas of concern, per the methodology described in the previous subheading titled "Environmental Justice Demographics," with respect to environmental justice. Furthermore, comparing each county against each other in Table 3.17-1 shows that Fresno and Merced Counties contain disproportionately high percentages of low-income population within the CCFO Planning Area.

3.17.4 Current Economic Conditions and Trends

The following provides a description of the current demographic and economic conditions at a localized level, while still being programmatic in nature. In addition to core demographic and economic indicators, this section also presents data on the oil and gas industry within the CCFO Planning Area, communities within areas designated with high oil and gas occurrence potential (refer to Figure 5-1), and areas identified as sensitive during the Social and Economic Workshop held on February 4, 2015 (BLM, 2015). Please refer to Appendix F for the complete Workshop Summary Report.

3.17.4.1 RMPA Social and Economic Workshop

In order to develop the social and economic analysis for the EIS and RMPA, the BLM has engaged public involvement that included a social and economic workshop. The Social and Economic Workshop (Workshop) was held on February 4, 2015. The purpose of the Workshop was to provide an opportunity for local government officials, community leaders, and other citizens to discuss regional economic conditions, trends, and strategies with BLM managers and staff.

Table 3.17-1. Demographic and Housing Statistics, by County

Category	Alameda	Contra Costa	Fresno	Merced	Monterey	San Benito	San Francisco	San Joaquin	San Mateo	Santa Clara	Santa Cruz	Stanislaus
Population (2014)	1,573,254	1,087,008	964,040	264,922	425,756	57,517	836,620	710,731	745,193	1,868,558	271,595	526,042
Minority population percentage	65.9%	52.2%	67.3%	68.2%	67.0%	62.0%	58.2%	64.1%	57.5%	64.8%	40.2%	53.3%
Low-income population percentage	12.0%	10.2%	24.8%	24.6%	16.1%	12.7%	13.2%	17.5%	7.4%	9.7%	14.4%	19.2%
2020 Projection	1,682,348	1,166,670	1,055,106	288,991	446,258	63,418	891,493	766,644	777,088	1,970,828	281,870	573,794
2030 Projection	1,835,340	1,281,561	1,200,666	337,798	476,874	73,459	967,405	893,354	822,889	2,151,165	295,538	648,076
2040 Projection	1,978,656	1,400,999	1,332,913	389,934	500,194	82,969	1,027,004	1,037,761	874,626	2,331,887	303,512	714,910
2050 Projection	2,115,824	1,512,940	1,464,413	439,075	520,362	90,802	1,081,540	1,171,439	925,295	2,482,347	307,606	783,005
2060 Projection	2,195,999	1,620,604	1,587,852	485,712	533,575	99,215	1,103,174	1,306,271	936,151	2,585,318	314,875	856,717
Housing Units (2014)	588,948	405,828	322,489	84,298	138,817	18,130	381,143	236,943	273,532	644,691	105,047	180,165
Vacant units	37,798 (6.4%)	25,266 (6.2%)	26,633 (8.3%)	8,108 (9.6%)	13,128 (9.5%)	1,079 (6.0%)	31,405 (8.2%)	18,987 (8.0%)	13,300 (4.9%)	28,233 (4.4%)	10,174 (9.7%)	14,375 (8.0%)
Average person per household	2.78	2.83	3.2	3.39	3.23	3.35	2.32	3.2	2.83	2.98	2.73	3.14
Median home price (2013)	$485,000	$392,500	$152,500	$148,000	$356,250	$355,000	$830,000	$215,000	$742,000	$645,000	$505,000	$175,000

Source: U.S. Census, 2015; DOF, 2014a; DOF, 2014b

The Workshop was held in Monterey County and 11 participants attended, which included local agency representatives, oil and gas industry representatives, and members of the general public. The workshop provided information on local and regional economic and social conditions and trends; assisted participants with identifying desired economic and social conditions; and identified ways to advance local economic and social goals through BLM's planning and policy decisions associated with the proposed RMPA. The major themes and issues identified during the workshop included:

- BLM-administered mineral estate designated as open on split estate leases can impact private land owners and hinder the local government economic goals and planning efforts should oil and gas surface activities be incompatible with surrounding land uses and long-term land use planning strategies;
- BLM planning and policy should consider consistency with local agencies' applicable plans and policies regarding oil and gas development; and
- The EIS should consider programmatic direct and indirect economic effects of continued oil and gas development within areas of the CCFO Decision Area where oil and gas occurrence potential is considered high.

3.17.4.2 Central Coast Field Office Planning Area

Table 3.17-2 summarizes current economic indicators for all 12 counties within the CCFO Planning Area boundary, including the most currently available data for the mineral extraction industry (which includes fossil fuels). As shown, Fresno County has the highest unemployment rate, with San Mateo County containing the lowest. Meanwhile, San Joaquin County is expected to see the greatest job growth through year 2019, with Monterey County expected to the see the least. Significant personal income growth is expected for all counties through year 2019.

As shown in Table 3.17-2, active oil and gas wells on BLM-administered mineral estate account for only 110 (0.6%) of the total 18,229 active wells within the CCFO Planning Area. With respect to the mineral extraction industry, Table 3.17-2 shows that Fresno, Monterey, and San Joaquin Counties contain the most active oil and gas wells within the CCFO Planning Area. Those counties, along with Contra Costa, Merced, and Santa Cruz Counties, have seen significant labor earning growth within the mineral extraction industry between years 2001 and 2012. While contributing significant labor earnings, the mineral extraction employment accounts for only a small percentage of the overall employment within each county (refer to Table 3.17-1).

Localized Communities of Interest

As described above, existing oil and gas leases within the CCFO Planning Area are primarily located within Fresno County, Monterey County, and San Benito County. Future oil and gas development is also likely to occur in these regions. These three counties comprise the local study area. Currently, each county receives substantial tax revenue from oil and gas fields as well as from employees' income taxes. Economic characteristics unique to each county include the following:

- **Fresno County.** An abundance and wide variety of mineral resources are present in this county not to mention the high-value crop diversity that ranks is the #2 county in the US after Kern County for the value of its agricultural production. Extracted resources include aggregate products (sand and gravel), fossil fuels (oil and coal), metals (chromite, copper, gold, mercury, and tungsten), and other materials used in construction or industrial applications (asbestos, high-grade clay, diatomite, granite, gypsum, and limestone). Aggregate and petroleum are the county's most significant extractive resources and play an important role in maintaining the county's overall economy (Fresno County, 2000).

Table 3.17-2. Economic Indicators by County

Category	Alameda	Contra Costa	Fresno	Merced	Monterey	San Benito	San Francisco	San Joaquin	San Mateo	Santa Clara	Santa Cruz	Stanis-laus
Median household income	$69,151	$74,815	$43,756	$42,741	$54,341	$63,613	$72,020	$50,168	$87,601	$88,478	$63,092	$44,053
Per capita income	$57,595 ranked 9th in CA	$65,106 ranked 5th in CA	$34,864 ranked 44th in CA	$31,293 ranked 56th in CA	$46,224 ranked 24th in CA	$39,422 ranked 37th in CA	$86,588 ranked 2nd in CA	$34,483 ranked 47th in CA	$79,021 ranked 3rd in CA	$70,772 ranked 4th in CA	$54,615 ranked 10th in CA	$35,434 ranked 45th in CA
Average salary per worker	$79,614	$77,456	$48,198	$45,813	$54,301	$49,593	$107,171	$51,179	$94,085	$113,951	$52,908	$50,993
Unemployment rate	5.7%	6.1%	12.1%	14.3%	9.3%	10.8%	4.4%	11.7%	4.2%	5.3%	9.0%	12.3%
Expected job growth (2014-2019)	7.9%	8.4%	10.7%	7.7%	6.3%	7.4%	8.4%	10.4%	9.4%	10.0%	6.8%	9.0%
Expected personal income growth (2014-2019)	15.7%	16.0%	16.3%	16.0%	13.5%	15.3%	19.2%	16.8%	19.1%	23.3%	17.2%	16.3%
MINERAL EXTRACTION INDUSTRY												
Active mines	8	4	13	18	13	11	3	11	3	4	4	7
Active oil and gas wells	93	663	11,550	195	3,596	388	0	1,225	196	112	65	146
Active oil and gas wells on Federal mineral estate[1]	0	2	35	0	14	56	0	0	0	0	3	0
Number of jobs	135	1,073	208	144	203	106	54	88	31	212	312	32
Average annual wage per worker	$94,191	$220,106	$83,449	N/A	$92,476	N/A	$126,335	$68,144	$82,040	$72,501	N/A	$51,826
Labor earning trends ($000)												
2001	68,122	539,630	22,062	1,691	28,062	12,733	30,530	17,092	13,342	57,980	4,763	3,668
2012	44,950	694,153	38,319	9,789	39,418	7,216	58,051	13,757	16,657	49,651	22,984	3,181

1 - Active well data provided by the California Department of Conservation, Division of Oil Gas and Geothermal Resources that intersected Federal mineral estate within the CCFO Planning Area.
N/A = Data Unavailable
Source: DOT, 2014; Headwaters Economics, 2014; U.S. BEA, 2014

- **Monterey County.** Large rural areas that are predominantly used for agricultural purposes characterize this county. The majority of oil and gas-related activities occur within the southern portion of the county, which is generally characterized by an income level that is less than the county average due to the high number of agricultural workers. During the Social and Economic Workshop, representatives from Monterey County expressed that the southern portion of the county is of greatest concern regarding oil and gas development, with potential future areas for oil and gas leasing located along the travel routes to tourist destinations (e.g., lakes and missions) in southern Monterey County. The County also expressed that planning for this portion of the county is intended to enhance recreation and tourism in efforts to encourage residents and businesses to develop outside the existing agriculture and energy sectors that have shaped the southern portion of the County (BLM, 2015). Substantial oil reserves are believed to underlay parts of the Salinas Valley; the San Ardo oil field is the largest oil field in Monterey County. In 2006, the San Ardo oil field ranked 41st in the nation in terms of oil production (Monterey County, 2008).

  In addition, representatives from Monterey County Resource Management Agency have indicated that there may be a potential loss of tax revenue should split estate leases be limited or decreased within the County (BLM, 2015). Currently the county receives substantial tax revenue from oil and gas fields as well as from employees' income taxes. However, as shown in Table 3.17-2, the 14 active oil and gas wells on Federal mineral estate lands within Monterey County only account for 0.4% of the 3,596 active wells within the county.

- **San Benito County.** This County is largely rural, with over 90 percent of its land used for farming, ranching, forestry, or other public uses (San Benito County, 2010a). San Benito County is not considered a major oil-producing region in California compared to other counties. Reserves within the county are estimated to be 101 million oil barrels (Mbbl) of oil and 63 million cubic feet (MMcf) of natural gas, while the top ten largest oil fields in the State contain up to 598,393 Mbbl of oil reserves and 329,109 MMcf of gas reserves (San Benito County, 2010b).

Local Study Area Socioeconomics

Table 3.17-3 provides a summary of socioeconomic data for the incorporated communities within areas designated with high oil and gas occurrence potential within the CCFO Planning Area (refer to Figure 5-1). These local study area communities (Coalinga, Greenfield, King City, Bradley CDP, San Ardo CDP, and San Lucas CDP) were identified as sensitive areas related to oil and gas extraction during the Social and Economic Workshop held on February 4, 2015 (BLM, 2015). As shown in Table 3.17-3, the cities of Coalinga (Fresno County) and King City (Monterey County) are the largest communities within highly active areas of oil and gas production within the CCFO Planning Area. Both the cities of Coalinga and Greenfield contain the majority of oil and gas workers and those in the utilities industries.

Local Study Area Economic and Fiscal Contribution of Oil and Gas Industry

BLM management decisions and policies affect many aspects of local and regional economy. Within the CCFO Planning Area, BLM administers approximately 284,000 acres of surface public land. BLM-administered lands within the CCFO Planning Area have the largest overarching influence on recreation and tourism aspects of local and regional economies. As shown in Table 3.17-2, active oil and gas wells on BLM-administered lands account for only 110 (0.6%) of the total 18,229 active wells within the CCFO Planning Area. However, all oil and gas leases issued by the BLM within the CCFO Planning Area generate revenue to the Federal Treasury. Because of the high oil and gas development and occurrence potential in the southern portion of the CCFO Planning Area, BLM management policy decisions on mineral estates does, at some level, influence the local economy and can contribute to, or affect, local governmental revenues.

Table 3.17-3. Socioeconomic Statistics for CCFO Planning Area Local Study Area Communities Within Areas Designated with High Oil and Gas Occurrence Potential

	Fresno County	Monterey County				
Category	**Coalinga**	**Greenfield**	**King City**	**Bradley CDP[1]**	**San Ardo CDP[1]**	**San Lucas CDP[1]**
Population	16,609	4,395	12,996	110	704	216
Minority population percentage	64.1%	66.8%	91.2%	28.2%	86.4%	97.7%
Low-income population percentage	22.8%	6.2%	20.5%	12.7%	20.3%	40.3%
Housing units (2014)	5,017	1,426	2,996	47	221	56
Vacant units	269 (5.4%)	107 (7.5%)	204 (6.8%)	6 (5.4%)	13 (5.4%)	6 (5.4%)
Median Household Income	$46,500	$47,759	$45,905	$51,750	$40,781	$47,500
Civilian Employed Workforce	6,141	1,853	4,500	37	183	61
Unemployment rate	8.6%	10.5%	21.1%	9.8%	51.6%	33.0%
Workforce in the mining, quarrying, and oil and gas extraction industries	154	102	0	0	9	3
Workforce in the construction industry	470	254	198	2	40	0
Workforce in the utilities industry	121	49	5	0	0	0

1 - A CDP (Census Designated Place) is a concentration of population identified by U.S. Census Bureau for statistical purposes. CDPs are populated areas that lack separate municipal government, but which otherwise physically resemble incorporated places.

Source: U.S. Census, 2015.

Table 3.17-4 summarizes recent economic and fiscal contributions of the oil and gas industry within Monterey County, Fresno County, and San Benito County (regional study area). As shown, oil and gas production within these counties has beneficial economic and fiscal contributions. The average fiscal contribution per well is greatest in San Benito County and least in Fresno County. As shown earlier in Table 3.17-2, active wells within these county boundaries located on BLM-administered lands account for only a small portion of the total wells. Therefore, oil and gas wells on Federal mineral lands have a minor economic and fiscal contributions compared to the totals shown in Table 3.17-4.

Federal mineral estate that contains existing oil and gas leases, and likely to contain future oil and gas development, is primarily located within the southern region of the CCFO Planning Area. Resource development on public lands can produce employment and growth in the future. Assuming market conditions and regulatory conditions are attractive, and the BLM allows additional leasing and development of public lands, local job creation and continuation of the established oil and gas industry would continue at some level. Depending upon the level of development, County revenues can be sensitive to resource development pace and patterns and thus BLM decisions. Specifically, oil and gas leases on Federal mineral estate lands directly and indirectly produce county tax revenue, as shown in Table 3.17-4.

Severance taxes are often levied by state governments and are typically defined as taxes imposed distinctively on removal of natural products including oil and gas. However, there is no statewide severance tax on oil and gas production in California (DOC, 2015). There are ad valorem (property) taxes in California, administered by each county that would apply to split estate leases issued by the BLM. Furthermore, tax revenue is generated by direct spending on oil and gas infrastructure, worker wage spending and from secondary and indirect employment.

Local Study Area Minority and Low-Income Populations

With respect to environmental justice and minority populations, Table 3.17-3 shows that all communities with the exception of Bradley contain a minority population exceeding 50%. Of note, the communities of King City, San Ardo, and San Lucas contain exceptionally high concentrations of minority population.

With respect to environmental justice and low-income populations, Table 3.17-2 shows the community of Coalinga contains a low-income population slightly below that of Fresno County (refer to Table 3.17-2). However, this community is still considered to have a high percentage of low-income population for consideration of environmental justice. Within Monterey County, Table 3.17-3 shows the communities of King City, San Ardo, and San Lucas contain low-income populations greater than that of Monterey County (refer to Table 3.17-2) and are considered environmental justice communities. Of note, these communities have negligible numbers of people working in the oil and gas or utilities industries (refer to Table 3.17-2).

Leases Subject to Settlement Agreement

As described in Chapter 1, the BLM-managed areas within the CCFO Planning Area contain 14 non-NSO leases, as identified in Hollister I and Hollister II. These lease areas are located both in south Monterey County (Leases CACA 052960, 052959, 053825, 053824, 053827, and 053826) and central San Benito County near the boundary with Fresno County (Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828). The nearest incorporated communities to these leases are Coalinga (Fresno County) and King City (Monterey County). A summary of the existing social and economic conditions for these communities is discussed earlier and shown in Table 3.17-3.

Table 3.17-4. Economic and Fiscal Contribution of Oil and Gas Industry – Monterey, Fresno, and San Benito Counties, 2012

MONTEREY COUNTY				
ECONOMIC CONTRIBUTION	**Employment**	**Labor Income ($ millions)**	**Value Added ($ millions)**	**Output ($ millions)**
Direct Employment[1]	1,087	$109.7	$191.4	$257.4
Indirect Employment	161	$8.1	$16.6	$24.4
Induced Employment	402	$17.8	$34.3	$49.0
Total Contribution	1,651	$135.6	$242.4	$330.8
Average Contribution per Active Well ($ dollars)[2]	**—**	***$37,709***	***$67,408***	***$991,991***

FISCAL CONTRIBUTION	**State and Local ($ millions)**	**Federal ($ millions)**	**Total Taxes ($ millions)**
Total Tax Revenue[3]	$136.6	$60.6	$197.2
Average Contribution per Active Well ($ dollars)[2]	***$37,987***	***$16,852***	***$54,839***

FRESNO COUNTY				
ECONOMIC CONTRIBUTION	**Employment**	**Labor Income ($ millions)**	**Value Added ($ millions)**	**Output ($ millions)**
Direct Employment[1]	1,924	$124.9	$252.4	$371.1
Indirect Employment	410	$19.2	$33.3	$51.6
Induced Employment	648	$26.4	$53.2	$77.6
Total Contribution	2,982	$170.5	$338.9	$500.3
Average Contribution per Active Well ($ dollars)[2]	**—**	***$14,762***	***$29,341***	***$43,316***

FISCAL CONTRIBUTION	**State and Local ($ millions)**	**Federal ($ millions)**	**Total Taxes ($ millions)**
Total Tax Revenue[3]	$290.1	$110.5	$400.6
Average Contribution per Active Well ($ dollars)[2]	***$25,117***	***$9,567***	***$34,684***

SAN BENITO COUNTY				
ECONOMIC CONTRIBUTION	**Employment**	**Labor Income ($ millions)**	**Value Added ($ millions)**	**Output ($ millions)**
Direct Employment[1]	197	N/A	N/A	N/A
Indirect Employment	N/A	N/A	N/A	N/A
Induced Employment	N/A	N/A	N/A	N/A
Total Contribution	268	$18.8	$34.4	N/A
Average Contribution per Active Well ($ dollars)[2]	**—**	***$48,454***	***$88,660***	***N/A***

FISCAL CONTRIBUTION	**State and Local ($ millions)**	**Federal ($ millions)**	**Total Taxes ($ millions)**
Total Tax Revenue[3]	N/A	N/A	$26.7
Average Contribution per Active Well ($ dollars)[2]	***N/A***	***N/A***	***$68,814***

Source: Los Angeles County Economic Development Corporation, 2014
N/A: Data Not Available
1 - Includes: Oil and gas extraction, support activities, natural gas distribution, oil and gas pipeline construction, petroleum refineries, petroleum and petroleum product wholesalers, gasoline stations, fuel dealers, pipeline transportation.
2 - Total divided by County well data provided in Table 3.17.2.
3 - Includes: Sales and excise taxes, property taxes, personal income taxes, corporate profits taxes, social insurance taxes, other taxes, and fees, fines, and permits,

3.18 Transportation and Access

3.18.1 Introduction

This section addresses transportation and access on lands managed by the Central Coast Field Office (CCFO). The regional transportation network, including highways, major roads, county roads, rail, and aviation is shown on Figure 3.18-1, although a detailed description of the regional network is not included here. The discussion of hazardous materials transport is in Sections 3.4 and 4.4 (Hazardous Materials and Public Safety).

This section focuses on BLM roads and trails that provide access to, and through, BLM public lands.

3.18.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/EIS), refer to Appendix J.

3.18.3 Regional Setting

BLM's Comprehensive Travel and Transportation Management (CTTM) program addresses all resource use aspects, such as recreational, traditional, casual, agricultural, commercial, and educational, and the accompanying modes and conditions of travel on public lands, not just motorized or off-highway vehicle (OHV) activities. Current vehicle management is based on the 2007 Hollister Resource Management Plan (RMP) and the Clear Creek Management Area RMP (BLM, 2014). These plans addressed a variety of concerns related to vehicle use, roadways, and resource protection, and provided guidelines for future road improvements, maintenance activities, and management decisions.

3.18.4 Current Conditions and Trends

Central Coast Field Office Planning Area

A network of Federal, State, and county roads provide access to the CCFO Planning Area. Figure 3.18-1 shows major public roads that provide regional access throughout the CCFO Planning Area boundary and surface transportation links between major population centers and BLM surface lands. Figure 3.18-1 also shows rail facilities within the CCFO Planning Area boundary.

BLM Roads and Trails

The BLM manages over 600 miles of roads and trails in the CCFO Planning Area for motorized and non-motorized use. Vehicle use on public lands managed by the CCFO is limited to designated open routes. Within the CCFO Planning Area, the BLM manages approximately 502 miles of motorized roads and trails and 112 miles of non-motorized trails. This network ranges from two-wheel drive accessible routes, four-wheel drive "two-track" roads, and "single-track" motorized trails.

Existing roads and trails in the Planning Area are categorized based on the type of use and maintenance they receive as shown in Table 3.18-1.

Table 3.18-1. Miles of BLM Roads and Trails in the CCFO Planning Area

Road Class	Characteristics	Miles
2	Secondary and connecting roads – hard surface, concrete or asphalt, usually undivided with single lane characteristics.	32
3	Local, neighborhood, rural, and light-duty – hard surface, gravel or dirt, constructed, regularly maintained.	367

Table 3.18-1. Miles of BLM Roads and Trails in the CCFO Planning Area

Road Class	Characteristics	Miles
4	Unimproved – primitive, constructed, sedan clearance, not regularly maintained.	0
5	Four-wheel drive, primitive (two-track), constructed, high clearance required, not regularly maintained. All-terrain vehicle trail (less than 52 inches wide) or single-track motorized (dirt bike, horse).	113
6	Non-motorized trail (less than 52 inches wide).	112

Source: BLM, 2007.

Currently, public lands in the area are generally accessible by motorized vehicles to agency personnel (for resource management), to commercial enterprise (for use or extraction of public resources), and to the general public (for recreation and enjoyment of public lands). Road system management has focused on maintaining major access roads, which generally receive most of the recreation traffic. Corrective maintenance occurs as problems are identified and funds permit. Road construction has been limited to improving or upgrading road segments to improve access or to alleviate maintenance or environmental problems.

As shown in Table 3.18-1, there are more than 113 miles of primitive roads and trails for vehicles to access BLM public lands managed by the CCFO. While these roads and trails are open for OHV use, no designated OHV areas are located within the CCFO Planning Area (BLM, 2015).

Recreation (non-OHV) Access

Recreation activities such as equestrian riding, hunting, and rock hounding often require some level of motorized vehicle access. There are 16 key access points to recreation areas in the CCFO Planning Area. These include Stockdale Mountain Access, Curry Mountain Access, Short Fence, Coalinga Mineral Springs, Condon Peak, Griswold Hills, Tumey Hills, and Panoche Hills.

Leases Subject to Settlement Agreement

The 14 non-NSO leases are located in the following two counties within the CCFO administrative boundary: Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828 in San Benito County and Leases CACA 052960, 052959, 053825, 053824, 053827, and 053826 in Monterey County. In San Benito County, the non-NSO leases are in a mountainous area that is less than 0.5 miles north of the San Benito Mountain Research Natural Area and approximately 4 miles south of the Panoche Hills South Wilderness Study Area. These leases are within the active Vallecitos oil and gas field or within approximately 7 miles of the field boundary. There are no designated open roads within or near these leases.

In Monterey County, the non-NSO leases are located across two mountainous areas with the first area approximately 4 miles west of the City of San Ardo and 4 miles north of Lake San Antonio, and the second area approximately 9 miles south of the City of San Ardo and 1.5 miles east of Lake San Antonio. The Monterey County leases are within approximately 10 miles of the active San Ardo oil and gas field, which is generally located east of the non-NSO leases in Monterey County. Some open roads are located within these leases within the Williams Hill Recreation Area described below.

The following BLM-designated land use is located in the Monterey County non-NSO lease area:

- **Williams Hill Recreation Area.** This BLM-managed recreation area allows dispersed and developed camping, hunting, mountain biking, horseback riding, and Off-Highway Vehicle recreation. Off-Highway Vehicle access is limited to approximately 11 miles of designated open routes (BLM, 2013). It crosses Lease CACA 053825.

3.19 Lands and Realty

3.19.1 Introduction

The Central Coast Field Office (CCFO) Lands and Realty program is aimed at managing the underlying land base that hosts and supports all BLM resources and management programs within its administrative area. The BLM works cooperatively to execute the CCFO Lands and Realty program with Federal agencies, the State of California, counties and cities, and other public and private landholders.

3.19.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/EIS), refer to Appendix J.

3.19.3 Regional Setting

The CCFO Planning Area is located in west-central California and encompasses 12 counties either in part or in full. The Decision Area for the RMPA includes approximately 793,000 acres of BLM-administered subsurface mineral estate underlying public lands or split estate lands within the CCFO Planning Area boundary. The public lands and mineral interests are primarily concentrated in the southern planning areas of Fresno, Monterey, and San Benito Counties. Adjacent landowners include private holdings and Federal, State, county, or local governments.

3.19.4 BLM Management Considerations for Lands and Realty

Management challenges identified for lands and realty in the CCFO Planning Area are based, in part, on historic activities and trends, as well as on current and future needs of public resources. Management challenges include managing BLM surface lands to adequately meet the needs of multiple uses per the FLPMA; improving the management of natural, public, and historic resources; bringing into public ownership lands with high public resource values; consolidating land and mineral ownership patterns for more streamlined management of resources and BLM programs; and disposing of lands identified for disposal. In order to accommodate multiple uses in a manner consistent with CCFO management objectives and plans, the BLM must identify public lands or resources for which the following management tools apply: (1) land use authorizations (e.g., leases, permits, Right-of-way (ROW) grants); (2) land tenure adjustments (e.g., sales, exchanges, donations, purchases); and (3) classifications and withdrawals.

Land Use Authorizations

Section 302 of the FLPMA provides the BLM's authority to issue leases/easements and permits for the use, occupancy, and development of public lands. Section 501 of the FLPMA authorizes BLM to grant ROWs. Leases, easements, and permits are issued for purposes such as ROWs and utility corridors, construction equipment storage sites, assembly yards, oil rig stacking sites, and water pipelines and well pumps related to irrigation and non-irrigation facilities (BLM, 2009). Leases, easements, and permits for oil and gas pipelines are issued by the BLM under the Mineral Leasing Act (MLA).

As described in Chapter 1, this RMPA/EIS discusses management of oil and gas resources in the CCFO Planning Area consistent with the 2015 RFD Scenario. Management actions considered in this RMPA/EIS include areas that would be closed to oil and gas leasing as identified for each alternative (see Sections 2.6 through 2.10). Areas that are open to oil and gas leasing may be subject to one of three types of stipulations: Controlled Surface Use, Timing Limitation, or No Surface Occupancy. These stipulations are described in Chapter 2.5.1.

Land Tenure Adjustments

Land ownership (or land tenure) adjustment includes those actions that result in the retention of public land, disposal of public land, or the acquisition by the BLM of nonfederal lands or interests in land. The FLPMA requires that public land be retained in public ownership unless, as a result of land use planning, disposal of certain parcels is warranted. Management of land tenure adjustments (e.g., acquisitions and disposal areas) is discussed in Section 3.18 of the 2007 HFO RMP. None of the RMPA alternatives would include adjustments to land tenure in the CCFO Planning Area.

Classifications

Land classification is a process required under specific laws to determine the suitability of public lands for certain types of disposal or lease, or suitability for retention and multiple use management. Most land classifications also segregate public lands from operation of some or all of the public land laws and mineral laws. Public land laws refer to the body of laws governing land disposal (e.g., sales, exchanges). None of the alternatives analyzed in this EIS would alter the land classifications within the CCFO Planning Area, as adopted in the 2007 HFO RMP.

Withdrawals

A withdrawal is a formal action that sets aside, withholds, or reserves Federal lands for public purposes. Withdrawals accomplish one or more of the following:

- Transfer total or partial jurisdiction of Federal land between Federal agencies;
- Dedicate Federal land to a specific purpose
- Segregate (close) Federal land from operation of some or all of the public land laws and (or) mineral laws. Most if not all existing withdrawals segregate from operation of the public land laws, unless the surface estate is in nonfederal ownership.

3.19.5 Current Conditions and Trends

Central Coast Field Office Planning Area

Current oil and gas development is concentrated within a limited area of the CCFO Planning Area. In the last decade, nearly all well development occurred in the Coalinga and Jacalitos oil fields (Fresno County), and the San Ardo and Lynch Canyon oil fields (Monterey County). The Federal share of mineral estate in these fields is approximately one percent, and as such, the BLM administers very little of the mineral estate in this area. Likewise, the Vallecitos oil fields located in San Benito County have very little production that occurs on BLM-administered mineral estate (BLM, 2014). Exploratory oil wells are not common in the CCFO Planning Area, and historically have been drilled on less than five percent of the leases issued on BLM-administered lands (BLM, 2014).

As described above, existing oil and gas leases within the CCFO Planning Area are primarily located within Fresno County, Monterey County, and San Benito County. Future oil and gas development is also likely to occur in these regions. Characteristics unique to each county include the following:

- **Fresno County.** An abundance and wide variety of mineral resources are present in this county. Extracted resources include aggregate products (sand and gravel), fossil fuels (oil and coal), metals (chromite, copper, gold, mercury, and tungsten), and other materials used in construction or industrial applications (asbestos, high-grade clay, diatomite, granite, gypsum, and limestone). Aggregate and petroleum are the county's most significant extractive resources and play an important role in maintaining the county's overall economy (Fresno County, 2000, pg. 5-9).

- **Monterey County.** This county is characterized by large rural areas that are predominately used for agricultural purposes. Substantial oil reserves are believed to underlay parts of the Salinas Valley; the San Ardo oil field is the largest in Monterey County. In 2006, the San Ardo oil field ranked 41st in the nation in terms of oil production (Monterey County, 2008, pg. 4.5-5).
- **San Benito County.** This county is largely rural, with over 90 percent of its land used for farming, ranching, forestry, or other public uses (San Benito County, 2010a, pg. 1-5). San Benito County is not considered a major oil-producing region in California compared to other counties. Reserves within the county are estimated to be 101 million oil barrels (Mbbl) of oil and 63 million cubic feet (MMcf) of natural gas, while the largest oil fields in the State contain up to 598,393 Mbbl of oil reserves and 329,109 MMcf of gas reserves (San Benito County, 2010b, pg. 8-68).

Leases Subject to Settlement Agreement

The 14 non-NSO leases are located in the following two counties within the CCFO Planning Area: Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828 in San Benito County and Leases CACA 052960, 052959, 053824, 053825, 053826, and 053827 in Monterey County. In San Benito County, the non-NSO leases are proposed in a mountainous area that is approximately 2.5 miles north of the San Benito Mountain Research Natural Area and approximately 5.6 miles south of the Panoche Hills South Wilderness Study Area; some of these leases would be located within active oil and gas fields. In Monterey County, the non-NSO leases are located across two mountainous areas with the first area approximately 3 miles west of the City of San Ardo and 4.5 miles north of Lake San Antonio, and the second area approximately 9.4 miles south of the City of San Ardo and 1 mile northeast of Lake San Antonio. Active oil and gas fields are located to the north and east of the non-NSO leases in Monterey County.

3.20 Utility Corridors and Communication Sites

This section describes the existing utility corridors and communication sites within the CCFO Planning Area boundary that would be applicable to the Proposed RMPA. Transportation corridors within the CCFO Planning Area are discussed in Section 3.18 (Transportation and Access).

3.20.1 Introduction

A ROW grant is an authorization to use a specific piece of public land for certain projects, such as developing roads, pipelines, transmission lines, and communication sites. The ROW grant authorizes rights and privileges for a specific use of the land for a specific period of time.

3.20.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/EIS), refer to Appendix J.

3.20.3 Regional Setting

The location of electricity, natural gas, and communication facilities is typically dependent upon the location of demand and utility service areas. Areas of greater population require a more extensive utility supply network. As summarized in the BLM's RMP/ROD for Designation of Energy Corridors (BLM, 2009, pg. 12), the western states have a critical need for long-distance energy transport infrastructure due in part to these states' unique geography and population distribution, where fuel sources and energy generation facilities are often remotely located and large population centers are spread far apart. These factors result in an electricity transmission grid characterized by high-voltage transmission lines spanning very long distances. Transmission system congestion can lead to rapid rises in electricity prices, and severe congestion may lead to loss of electricity supplies and blackouts in some areas.

3.20.4 Current Conditions and Trends

Central Coast Field Office Planning Area

Figure 3.20-1 shows the location of existing transmission lines, pipelines, and pipeline facilities that constitute utility corridors within the CCFO Planning Area. As discussed in Section 3.17 (Social and Economic Conditions), the concentration of utility infrastructure (i.e., pipeline facilities, pipelines, transmission lines) around the San Francisco Bay areas of Contra Costa, Alameda, Santa Clara, San Mateo, and San Francisco Counties is consistent with the greater population size of this region relative to other communities within the CCFO Planning Area. Existing utility infrastructure within the CCFO Planning Area is also clustered in northern Monterey County (due to a greater population density than in the southern area) as well as in southeastern Fresno County (due to active oil and gas wells).

The electricity and natural gas utility providers in the CCFO Planning Area primarily include investor-owned utilities, which are private utility providers regulated by the California Public Utilities Commission. Some publicly owned utilities (i.e., municipal districts, city departments, irrigation districts, or rural cooperatives) also provide services to communities within the CCFO Planning Area. Publicly owned utilities are subject to local public control and regulation. Electricity providers in the CCFO Planning Area include Pacific Gas and Electric, Silicon Valley Power, Merced Irrigation District, Turlock Irrigation District, and Lodi Electric Utility. Natural gas utility providers include Pacific Gas and Electric, City of Palo Alto Utilities, and Southern California Gas (DOC, 2015).

Communication facilities on public lands include broadcast uses (e.g., radio, broadcast translator, cable television, or television broadcast) and non-broadcast uses (cellular telephone, commercial mobile radio service, facility manager, local exchange network, microwave, private communication uses, passive

reflector, private mobile radio service, wireless internet service provider, Wi-Fi, or WiMAX) (BLM, 2012). Existing communication sites are located in the San Benito Management Area (i.e., Call Mountain), Central Coast Management Area (i.e., Fort Ord National Monument, Carmel Valley, and Stockdale Mountain), Salinas Management Area (i.e., Priest Valley), and San Joaquin Management Area (BLM, 2006).

Leases Subject to Settlement Agreement

Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828 are located within or adjacent to active oil and gas fields in San Benito County, and Leases CACA 052960, 052959, 053824, 053825, 053826, and 053827 are approximately 2 miles to the south and west of the active San Ardo oil and gas fields in Monterey County. Existing pipelines and pipeline facilities are located in the region to provide service to existing oil and gas facilities.

3.21 Wild and Scenic Rivers

3.21.1 Introduction

The Bureau of Land Management (BLM) applies planning and management guidance for special designations within the National System of Public Lands created by presidential proclamations or acts of Congress. The Wild and Scenic Rivers Act of 1968 (Public Law 90-542) was passed by Congress to preserve riverine systems that contain outstanding features. The law was enacted during an era when many rivers were being dammed or diverted, and is intended to balance this development by ensuring that certain rivers and streams remain in their free-flowing condition. The BLM is mandated to evaluate stream segments on public lands as potential additions to the National Wild and Scenic Rivers System during the Resource Management Plan (RMP) process under Section 5(d) of the Act. Formal designation as a National Wild and Scenic River (NWSR) requires Congressional legislation, or designation can be approved by the Secretary of Interior if nominated by the governor of the state containing the river segment.

The BLM evaluated waterways within the Central Coast Field Office (CCFO) Planning Area boundary for potential inclusion in the Wild and Scenic Rivers System during completion of the RMP/EIS for the Southern Diablo Mountain Range and Central Coast of California (BLM, 2007) and the Clear Creek Management Area RMP/EIS (BLM, 2014). This section describes the river segments that would be applicable to the Proposed RMPA. Impacts to river segments managed by the BLM within the CCFO Planning Area boundary are discussed in Section 4.21.

3.21.2 Regulatory Framework

For a brief discussion of the regulatory framework (i.e., federal, state, and local laws and/or plans that are relevant to the RMPA/EIS), refer to Appendix J.

3.21.3 Regional Setting

In 2014, the BLM completed a Wild and Scenic River Inventory as part of its Record of Decision and Approved Resource Management Plan for the Clear Creek Management Area (Appendix VI). The Central Coast Field Office Wild and Scenic River Inventory identified 11 river segments in the CCFO Planning Area as eligible for inclusion in the NWSR System (BLM, 2014; Appendix VI). Figure 3.21-1 shows the location of these eligible segments within the CCFO Planning Area, and Table 3.21-1 summarizes the information for each segment.

Table 3.21-1. Eligible Wild and Scenic Rivers in Central Coast Field Office Planning Area

River Name / Segment	BLM Length (miles)	Segment / Reach Identification	Outstanding Remarkable Value
Picacho Creek	2.0	Coalinga SM, T18S., R12E., SEC 19, 30, T18S., R11E., SEC 25	Recreational, other
White Creek	2.8	Coalinga SM, T19S., R13E., SEC 4, 8, 9, 17	Historical, cultural
Larious Creek	2.5	Coalinga SM, T17S., R11E., SEC 26, 35, 36	Historical, cultural
East Fork of San Carlos Creek	1.4	Coalinga SM, T18S., R12E., SEC 2, T17S., R12E., SEC 22, 26, 35	Geological
San Carlos Creek	1.0	Coalinga SM, T18S., R12E., SEC 4, 5	Geological, historical
San Benito River (1)	0.8	Coalinga SM, T18S., R12E., SEC 32, 5	Scenic, geological, other
San Benito River (2)	0.5	Coalinga SM, T18S., R12E., SEC 25, 26	Scenic, geological, other
San Benito River (3)	0.3	Coalinga SM, T17S., R10E., SEC 16, 17	Scenic, geological, other

Table 3.21-1. Eligible Wild and Scenic Rivers in Central Coast Field Office Planning Area

River Name / Segment	BLM Length (miles)	Segment / Reach Identification	Outstanding Remarkable Value
Cantua Creek	3.8	Coalinga SM, T18S., R12E., SEC 1, 12, 13, 24 T18S., R13E., SEC 5, 6	Scenic, recreational
Clear Creek and Tributaries	7.0	Coalinga SM, T18S., R12E., SEC 8, 9, 17 T18S., R11E., SEC 1, 11, 12, 15, 16	Scenic, recreational, fish & wildlife, geological, historical, cultural, other
Sawmill Creek	1.5	Coalinga SM, T18S., R12E., SEC 1, 4, 15, 22	Fish & wildlife, historical, other

SM= BLM Surface Management Map
"Other" Outstanding Remarkable Value includes Ecological values
Source: BLM, 2014; Appendix VI

2014 Suitability Determination by BLM

The eligible river segments listed in Table 3.21-1 were reviewed by the BLM to determine if any are suitable for inclusion in the NWSR System. The suitability study report that was included in the BLM's 2014 Wild and Scenic River Inventory describes the characteristics that do or do not make the stream segment a worthy addition to the system, the current status of land ownership and use in the area, as well as the reasonably foreseeable potential uses of the land and water which would be enhanced, foreclosed, or curtailed if the area were included in the system (BLM, 2014; Appendix VI).

None of the eligible river segments within in the CCFO Planning Area listed in Table 3.21-1 were recommended for inclusion in the NWSR System. The BLM found that many of the watersheds have been substantially modified through past mining and logging activities and the associated construction of roads and trails, and concluded that the resulting landscapes would not broaden the representation of key ecosystems within the NWSR System (BLM, 2014; Appendix VI).

3.21.4 Current Conditions and Trends

Central Coast Field Office Planning Area

There is one designated NWSR that is within the CCFO Planning Area boundary but is not located on land administered by the BLM. The Big Sur River was designated in 1992 and is managed by the U.S. Forest Service. Classified as a "Wild" river, it extends 19.5 miles through the Los Padres National Forest to the boundary of the Ventana Wilderness (NWSRS, 2015b). The Big Sur River is not in the vicinity of Federal mineral estate (see Figure 3.21-1).

Leases Subject to Settlement Agreement

There are no designated NWSR within the leases subject to settlement agreement. Of the 11 eligible NWSR segments in the CCFO Planning Area, two river segments are in close proximity to the non-NSO leases: the East Fork San Carlos Creek segment extends into a non-NSO lease (Lease CACA 053834), and the Larious Creek segment is less than one mile south of the non-NSO leases (Leases CACA 053832 and 053835). As described in Section 3.21.3, neither of these eligible river segments were recommended for inclusion in the NWSR System (BLM, 2014; Appendix VI).

4. Environmental Consequences

4.1 Introduction

This chapter analyzes the environmental consequences, or impacts, that are expected to occur as a result of implementing the management actions described in Chapter 2. The depth and breadth of the impact analyses presented in this chapter is commensurate with the level of detail of the management actions presented in Chapter 2, and on the availability and/or quality of data necessary to assess impacts. The baseline used for expected impacts is the current conditions in the Planning Area described in Chapter 3 (Affected Environment). The analysis for the proposed plan amendment is presented by resource and organized into the following sections:

- Summary of goals and management actions that affect the resource; and
- Analysis of direct and indirect impacts and mitigation specific to the proposed plan amendment on an area-wide basis, and then to the leases subject to litigation.

Cumulative impacts are discussed in Chapter 5 (Cumulative Impacts).

4.1.1 Impact Analysis Methodology

In general, impacts to resources in the Planning Area are analyzed by determining the effects on a given resource from oil and gas leasing and development management actions that would occur for each alternative under the 2015 RFD Scenario (see Appendix B).

Impacts are related to desired future conditions by comparing the impacts from implementation of management actions to achieving the goals and objectives specified for each resource/resource program and to the existing environmental conditions. For management actions that do not achieve the stated goals and objectives or that generally do not meet BLM's multiple use mandate, or that result in significant negative changes to physical or social conditions, the impact is characterized as adverse. For management actions that do achieve goals and objectives, the impact is characterized as beneficial. If a management action does not specifically affect a desired future condition, there is no impact. Finally, if there is not enough specificity to determine whether a management action would achieve the goals and objectives, the impact can only be described in general terms.

4.1.2 Types of Impacts to be Addressed

Direct and Indirect Impacts

Terms referring to the intensity, context (geographic extent), and duration of impacts are used in this chapter. Impacts are not necessarily only negative; positive benefits are specified as such. The standard definitions for terms used in the impacts analysis include the following:

- **Adverse** – the effect is negative.
- **Beneficial** – the effect is positive.
- **Negligible** – the effect is at the lower level of detection; change would be hard to measure.
- **Minor** – the effect is slight but detectable; there would be a small change.
- **Moderate** – the effect is readily apparent; there would be a measurable change that could result in small but permanent change.
- **Major** – the effect is large; there would be a highly noticeable, long-term, or permanent measurable change.

- **Localized** – the effect occurs in a specific site or area.
- **Temporary** – the effect occurs only during implementation of a management action.
- **Short-term** – the effect occurs only for a short time after implementation of a management action.
- **Long-term** – the effect occurs for an extended period after implementation of a management action.
- **Permanent** – the effect is irreversible; the resource would never revert to current conditions.
- **Direct** – effect that occurs as a result of actions on the resource being addressed.
- **Indirect** – effect that occurs as a result from actions on other resources.

Off-site and Cumulative Impacts

Off-site impacts are impacts that occur to resources or lands outside the Planning Area as a result of BLM oil and gas leasing management actions taking place within the Planning Area.

Cumulative impacts are addressed in Chapter 5 (Cumulative Impacts). Cumulative impacts are defined as:

> *The impact on the environment which results from the incremental impact of the action when added to past, present, or reasonably foreseeable future actions, regardless of what agency or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Cumulative impacts can result from similar projects or actions, as well as projects or actions that have similar impacts* (40 CFR 1508.7).

The time frame for the cumulative impacts analysis begins at the anticipated time the RMPA would take effect, and extends for the 15- to 20-year life of the plan.

4.1.3 Incomplete or Unavailable Information

Impacts are quantified where possible. Impacts are sometimes described using ranges of potential impacts or in qualitative terms. In the absence of quantitative data, impacts are described based on the professional judgment of the interdisciplinary team of technical specialists using the best available information. Impacts analysis based on incomplete or unavailable information is identified where applicable in the Introduction for each resource area in this chapter.

4.1.4 Assumptions

Several general assumptions were made to facilitate the analysis of potential impacts. The assumptions listed below are common to all resources. Other assumptions specific to a particular resource are listed under that resource.

- Changes in BLM policies have been made since the 2007 RMP was approved.
- Funding and personnel would be sufficient to implement any alternative described.
- The approved RMPA would be in effect for 15 to 20 years.

4.1.5 Incorporation by Reference

The California Council on Science and Technology (CCST) reports are incorporated in this RMPA/EIS by reference. The CCST report *Advanced Well Stimulation Technologies in California* was released in August 2014. This report synthesizes and assesses the available scientific and engineering information associated with well stimulation techniques, including hydraulic fracturing. It includes information on the geology

for oil and gas potential in California with respect to any changes in the potential due to advanced well stimulation techniques (CCST, 2014).

The CCST also released the report *An Independent Scientific Assessment of Well Stimulation in California* in three volumes. The report synthesizes and assesses the available scientific information associated with well stimulation treatments in California including hydraulic fracturing, matrix acidizing, and acid fracturing. Volume 1 "Geology and Well Stimulation Treatments" (January 2015) describes what well stimulation treatments are, how they are conducted and practiced in California, and where they have been and are being used in the State (CCST, 2015a). Volume II "Potential Environmental Impacts of Hydraulic Fracturing and Acid Stimulations" (July 2015) discusses how well stimulation could affect water, atmosphere, seismic activity, wildlife and vegetation, and human health. Volume II reviews available data, and identifies knowledge gaps and alternative practices that could avoid or mitigate these possible impacts (CCST, 2015b). Volume III "Case Studies of Hydraulic Fracturing and Acid Stimulations in Select Regions: Offshore, Monterey Formation, Los Angeles Basin and San Joaquin Basin" (July 2015) presents four case studies that assess environmental issues and qualitative risks for specific geographic regions: Offshore, Monterey Formation, Los Angeles Basin, and the San Joaquin Basin (CCST, 2015c).

4.2 Energy and Minerals

Minerals management considers the impacts on commercial/industrial development, casual use, and recreational collection of mineral resources and on energy sources. The RMPA addresses potential future oil drilling of up to 37 new wells and the associated 206 acres of ground disturbance and potential impacts that would restrict or limit the development of solid mineral resources on Federal mineral estate. An impact would occur if oil well drilling and development restricted access to other minerals or energy development.

4.2.1 Introduction

Oil and gas exploration and production and limited salable mineral production currently take place in the Central Coast Field Office Planning Area. Currently, no commercial-scale solar and wind energy development exist within the CCFO Planning Area on BLM-administered lands. Commercial-scale wind is unlikely to be developed on BLM-administered lands in the CCFO Planning Area because wind resources are poor. It is unlikely that commercial-scale solar projects would be developed on BLM-administered land in the CCFO Planning Area because most of the land does not have less than 5 degree slope. While it is possible to build solar projects on areas with a greater than 5 degree slope, such projects would require more grading and would be less commercially viable at a commercial-scale. These resources are not discussed further in this section.

This RMPA/EIS goal for energy and mineral resource management is to allow development of energy and mineral resources to meet the demand for energy and mineral production while protecting natural and cultural resources in the area.

To achieve this goal, the following objectives related to oil and gas leasing and development would be established:

- Balance responsible mineral resource development with the protection of other resource values;
- Provide opportunities for mineral exploration and development under the mining and mineral leasing laws;

The Management Actions from the 2007 HFO RMP and new management actions for oil and gas leasing are presented in Section 2.

Types of Impacts

Direct impacts to minerals are considered to be those that prohibit the development of Federal mineral estate. Indirect impacts include where new oil well drilling sites or expansion of existing fields restrict access to surface mineral deposits and limit the overall production. It is unlikely that a single new well site covering 1 to 2 acres would completely affect the feasibility of developing a profitable commercial sand and gravel or building stone quarry. Multiple well pads could potentially reduce the feasibility of developing a sand and gravel or building stone quarry. In some cases it may be possible to access deep petroleum resources using directional drilling techniques without limiting future development of mineral deposits. Shared access roads and joint development of solid mineral and oil and gas resources, where coincident, are commonly practiced where feasible and without conflict.

BLM is unable to quantify impacts to energy and minerals from the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Other incomplete or unavailable information includes site-specific resource conditions because it's impossible for BLM to know where or when leases would be developed.

The evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.2. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as

opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects to energy and minerals from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground.

The lack of information regarding the direct effects of future leasing and development on a lease does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of Federal mineral estate in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99 percent) of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects of future leasing and development on resources in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

Assumptions

- The same level of oil and gas development under the 2015 RFD Scenario would apply to Alternatives A, C, D, E, and F (i.e., up to 37 exploratory and development wells on 206 acres of disturbance). Alternative B assumes up to 32 exploratory and development wells on up to 179 acres of disturbance.
- All surface-disturbing activities related to the 2015 RFD Scenario would likely occur on BLM-administered mineral estate in Fresno, Monterey, and San Benito Counties within the area of high oil and gas occurrence potential (shown in Figure 5-1) for the CCFO Planning Area but could occur in any open areas throughout the CCFO Planning Area.
- Most new oil and gas well locations developed under the 2015 RFD Scenario would likely be within, or proximate to, established producing oil and gas fields or near lands that are already leased for such activities.
- Sand and gravel needed for construction on the oil and gas leases would be minor given the limited amount of new roads. Sand used in well stimulation generally is not mined in California (DOC, 2015).
- Ancillary facilities for oil and gas production (e.g., pipelines, compressor stations, etc.) and downstream activities such as oil processing at refineries and natural gas transmission and distribution are separate activities that would not be substantially affected by the RFD Scenario, 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.

4.2.2 Impacts Common to All Alternatives

Interference between oil well drilling and existing or future mining activities would occur if oil drilling pads, access roads, or oil field facilities overlay the minerals to be developed and thus restricted mining access. Mines and renewable energy projects operate with distinct boundaries, so-called "footprints". New well sites could be accessed via existing roads with permission to cross granted by the mine or energy operator. If new oil wells must target subsurface petroleum beneath surface mines or renewable energy projects, directional drilling will be required. Conversely, new or future oil well sites could restrict access to underlying mineral deposits. However, in general, a relatively small oil well pad and access road would not completely restrict access to potential surface deposits of sand and gravel, building stone, shale and limestone. Similarly, oil and gas could be compatible with some types of renewable energy.

Drilling of up to 37 new oil and gas wells on Federal oil and gas leases with approximately 206 acres of surface land occupancy could locally impact access to surface mineral deposits. As discussed above, an impact would occur if some or all the mineral resource could not be developed. However, the temporary nature of many oil well sites would not completely restrict access to other minerals. Similarly, existing mines would not completely interfere with the future oil well drilling as directional drilling techniques would make petroleum targets accessible. Consequently, temporary restrictions to mineral access would occur only where future well drilling sites are permitted within known mineral resource areas. The full buildout of the RFD scenario (i.e., 37 exploratory and development wells and 206 acres of surface disturbance) is assumed for each alternative herein, except Alternative B, which assumes up to 32 new development wells (179 acres of surface disturbance).

For all alternatives, oil and gas exploration and development could occur in any of the Federal estate lands within the CCFO Planning Area and could potentially affect access to surface mineral deposits.

Leases Subject to Settlement Agreement

For all alternatives, the leases subject to the settlement agreement are located in hillside areas not currently supporting active mines. The Vallecitos field, which contains Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828, is located north of the historic New Idria mercury mine. The Carmel Stone Mine (Section 28, T22S, R9E), a Monterey Shale surface mine, is located within one lease located approximately 6 miles west of San Ardo and north of Williams Hill (Lease CACA 053825).

4.2.3 Impacts of Alternative A (No Action)

Alternative A has the most acres open (available with standard lease stipulations and endangered species stipulations) to oil and gas leasing and provides the most flexibility for oil and gas development and would not affect potential future operations. Impacts to surface mineral deposits would be the same as described in Section 4.2.2 but could occur within a larger area.

Alternative A would utilize the 2015 RFD Scenario while continuing current management under the existing 2007 HFO RMP (BLM, 2007).

The existing 2007 HFO RMP developed the following Management Actions under other resource programs that could impact energy and mineral development:

- **Social and Economic Conditions.** Management actions specified for social and economic conditions address varying degrees of promoting commodity development in the Planning Area, which can affect the degree to which energy and minerals development can be implemented economically.
- **Transportation and Access.** Several management actions for transportation and access impose limitations on vehicle use, development of new roads, and closure of existing road networks in the Planning Area. Since energy and minerals development requires the use of vehicles and potentially new road construction, this resource program has the potential to significantly affect the ability to develop these resources.

Mitigation Measure EM-1 (Review Mineral Potential) (see Appendix C) addresses the potential conflict of access between surface mineral resources and future oil well drilling. The measure outlines the procedures that could be implemented to lessen the degree of potential adverse energy and mineral impacts from development of oil and gas leases under Alternative A. During review of whether to accept or deny project proposals, BLM managers could decide to attach additional stipulations or measures, such as the following, to minimize or avoid potential energy and mineral effects.

Leases Subject to Settlement Agreement – Subalternative 1

The 14 non-NSO leases as identified in Hollister I and Hollister II would be issued. As such, no impact would occur to potential lease holders.

As discussed in Section 4.4.2 (Impacts Common to All Alternatives), the 14 non-NSO leases as identified in Hollister I and Hollister II are located in areas near or within historic or recent mine areas. Therefore, potential energy and minerals impacts for these lease areas would be similar to those discussed for the larger Planning Area. Given that there may be mineral resource potential in the area of the leases that could be precluded, implementation of Mitigation Measure EM-1 (see Appendix C) is required before granting the lease or included as a lease stipulation.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impact would occur.

4.2.4 Impacts of Alternative B

Alternative B would limit leasing to existing oil and gas fields defined by DOGGR with 754,000 acres closed to leasing. This alternative provides the least flexibility for oil and gas operators, and would limit the locations where future exploratory wells could be drilled. The open areas could experience drilling of up to 32 new wells and would have the same potential for creating mineral access restriction in these areas. Impacts to surface mineral deposits would be the same as described in Section 4.2.2 but could occur within a smaller area.

Mitigation Measure EM-1 (Review Mineral Potential) (see Appendix C) would apply to Alternative B.

Leases Subject to Settlement Agreement

Under Alternative B, the majority of BLM-managed areas that contain the 14 non-NSO leases would be closed to leasing, so potential restriction to mineral access would be minimal. The area that remains open would not be near existing mineral operations so the leases would be unlikely to have any effects to minerals. Mitigation would not need to be applied.

4.2.5 Impacts of Alternative C

Alternative C would limit leasing to high oil and gas occurrence potential areas with over 394,400 acres closed to leasing. This alternative provides less flexibility for oil and gas operators than Alternative A but more than Alternative B. The open areas could experience drilling of up to 37 new wells and would have the same potential for creating mineral access restriction. Impacts to surface mineral deposits would be the same as described in Section 4.2.2 but could occur within a smaller area.

Mitigation Measure EM-1(Review Mineral Potential) (see Appendix C) would apply to Alternative C.

Leases Subject to Settlement Agreement

The 14 non-NSO leases as identified in Hollister I and Hollister II would be open. As such, no impact would occur to the potential lease holders because the lessee would still have a lease upon which a well could be drilled.

As discussed in Section 4.4.2 (Impacts Common to All Alternatives), the 14 non-NSO leases as identified in Hollister I and Hollister II are located in areas near or within historic or recent mine areas. Therefore, impacts for these lease areas would be similar to those discussed for the larger Planning Area. Given that there may be mineral resource potential in the area of the leases that could be precluded, implementation

of Mitigation Measure EM-1 (see Appendix C) is required before granting the lease or the mitigation measure must be included as a lease stipulation.

4.2.6 Impacts of Alternative D

Alternative D would limit leasing to Federal mineral estate underlying BLM surface estate areas with 655,400 acres closed to leasing. This alternative provides less flexibility for oil and gas operators than Alternative A, Alternative C, and Alternative F, but more than Alternative B. The open areas could experience exploration by up to 37 new wells and would have the same potential for creating mineral access restriction. Impacts to surface mineral deposits would be the same as described in Section 4.2.2 but could occur within a smaller area.

Mitigation Measure EM-1 (see Appendix C) would apply to Alternative D.

Leases Subject to Settlement Agreement

Under Alternative D, the majority of BLM-managed areas that contain the 14 non-NSO leases would be closed to leasing, so potential restriction to mineral access would be minimal. The area that remains open would not be near existing mineral operations so the leases would be unlikely to have any effects to minerals. No mitigation would need to be applied.

4.2.7 Impacts of Alternative E

Alternative E would allow leasing in Federal mineral estate outside of California DWR designated groundwater basins and sub-basins with 99,400 acres closed to leasing. This alternative provides less flexibility for oil and gas operators than Alternative A and Alternative F but more than Alternative B, Alternative C, and Alternative D. The open areas could experience exploration by up to 37 new wells and would have the same potential as Alternative A for creating mineral access restriction. Impacts to surface mineral deposits would be the same as described in Section 4.2.2 but could occur within a smaller area.

Mitigation Measure EM-1 (Review Mineral Potential) (see Appendix C) would apply to Alternative E.

Leases Subject to Settlement Agreement

The majority of the 14 non-NSO leases as identified in Hollister I and Hollister II would be open; however approximately 7,200 acres would be subject to NSO limiting the lease holder operations.

As discussed in Section 4.4.2 (Impacts Common to All Alternatives), the 14 non-NSO leases as identified in Hollister I and Hollister II are located in areas near or within historic or recent mine areas. Given that there may be mineral resource potential in the area of the leases that could be precluded, implementation of Mitigation Measure EM-1 is required before granting the lease or the mitigation measure must be included as a lease stipulation.

4.2.8 Impacts of Alternative F

Alternative F would allow leasing in Federal mineral estate in all areas unless currently closed under the 2007 Hollister Field Office RMP with 67,500 acres closed to leasing. This alternative provides slightly less flexibility for oil and gas operators than Alternative A due to the NSO restrictions, but more than Alternative B, Alternative C, Alternative D, and Alternative E. The open areas could experience exploration by up to 37 new wells and would have the same potential as Alternative A for creating mineral access restriction. Impacts to surface mineral deposits would be the same as described in Section 4.2.2 but could occur within a smaller area due to the NSO areas.

Mitigation Measure EM-1 (Review Mineral Potential) (see Appendix C) would apply to Alternative F.

Leases Subject to Settlement Agreement

The 14 non-NSO leases as identified in Hollister I and Hollister II would be open. As such, no impact would occur to the potential lease holders because the lessee would still have a lease upon which a well could be drilled.

As discussed in Section 4.4.2 (Impacts Common to All Alternatives), the 14 non-NSO leases as identified in Hollister I and Hollister II are in areas near or within historic or recent mine areas. Therefore, impacts for these lease areas would be similar to those discussed for the larger Planning Area. Given that there may be mineral resource potential near the leases that could be precluded, implementation of Mitigation Measure EM-1 (see Appendix C) is required before granting the lease or the mitigation measure must be included as a lease stipulation.

4.3 Geology

A wide range of potential impacts, including land subsidence, expansive soils, landslides and seismically induced landslides, and seismic hazards of surface fault rupture and strong ground shaking, were considered for the CCFO Planning Area and potential well drilling sites. Geologic formations, slope conditions, and proximity to active faults were considered by their potential to contribute to geologic hazards. Areas prone to risk for potential adverse impacts due to existing geologic, topographic, or soils conditions were identified and their relationship to proposed project components analyzed. Where existing conditions suggest a potential risk or impact, mitigation measures were identified to reduce the risk or impact.

4.3.1 Introduction

The 2007 RMP includes no specific geologic hazard management actions.

BLM is unable to quantify impacts to geology from the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.3. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects to geology from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 issued leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground.

The CCST report was unable to quantify increased risks of induced seismicity because reliable data cannot be obtained. The CCST study explains there is a general lack of monitoring [or data available] to make inferences regarding the effects of well stimulation techniques in California, and all that can be done is to review and summarize what has been observed in other states or the published literature. This information should be taken as background material, which can direct further monitoring and observation in California. Therefore, BLM's evaluation of such impacts is based upon theoretical approaches or research methods discussed in the CCST study and Section 3.3.

The missing or incomplete information does not hinder the BLM's evaluation of the impacts to the environment from proposed leasing and development of Federal mineral estate in the Planning Area because researched literature indicates the potential for induced seismicity from currently practiced well stimulation treatments and wastewater injection in California is low (DOC, 2015). The RFD Scenario indicates the majority (99 percent) of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. California regulations require operators to disclose geologic features, including known faults, in applications for oil and gas development to reduce the potential seismic hazard impacts of well stimulation activities or fluid disposal in injection wells. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects of future leasing and development on resources in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

Assumptions

- The same level of oil and gas development under the 2015 RFD Scenario would apply to Alternatives A, C, D, E, and F (i.e., up to 37 exploratory and development wells on 206 acres of disturbance). Alternative B assumes up to 32 exploratory and development wells on up to 179 acres of disturbance.
- All surface-disturbing activities related to the 2015 RFD Scenario would likely occur on BLM-administered lands in Fresno, Monterey, and San Benito Counties within the area of high oil and gas occurrence potential (shown in Figure 5-1) for the CCFO Planning Area but could occur on any open lands throughout the CCFO Planning Area.

- Ancillary facilities for oil and gas production (e.g., pipelines, compressor stations, etc.) and downstream activities such as oil processing at refineries and natural gas transmission and distribution are separate activities that would not be substantially affected by the RFD Scenario, 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.

4.3.2 Impacts Common to All Alternatives

A geologic hazard impact is considered significant if people, property or the environment experience adverse effects or a loss. Typically, earthquake ground shaking and fault rupture hazards are considered for structures where human occupancy occurs for extended periods of time (residence or work facilities). However, ground shaking or fault rupture within oil field areas that results in damage to an oil well (cement seals or casing failure), leaks of hazardous materials or chemicals, or ruptures of crude oil pipelines could also impact the environment. Surface rupture along faults could result in significant damage to oil field facilities including access roads, pipelines, and storage tank batteries. Although liquefaction potential and expansive soils are site-specific issues that may not affect many locations in the Planning Area, they should be evaluated before designing and constructing long-term storage tank facilities for oil or hazardous chemicals. Landslides could damage access roads and pipelines resulting in risk of injury or spills of chemicals or crude oil. The extraction of oil and gas, including the use of enhanced recovery practices, and groundwater can lead to land subsidence and a permanent reduction in aquifer storage (CCST, 2014). The amount of subsidence would depend on local conditions, including how much water is withdrawn and how much is injected back into the subsurface formations and where (CCST, 2014). One study of oil and gas fields in Houston found that oil and gas withdrawal was responsible for a very small portion of the total observed land subsidence (Holzer and Bluntzer, 1984). There are also many instances where enhanced recovery projects resulted in significant land deformation and subsidence (Taylor *et al*., 2014). As described in Section 4.7 (Groundwater Resources), groundwater use for well stimulation treatments in the RFD Scenario is expected to be very small (up to 55 acre-feet per year). Consequently, the anticipated land subsidence impacts are minor. A more detailed analysis of potential impacts to aquifer storage and land subsidence would be required on a site-specific basis as appropriate.

The potential for induced seismicity due to hydraulic fracturing or fluid disposal in Class II injection wells as they are currently carried out is considered to be low (CCST, 2014). Stimulation activities applied at the scale presently employed in other regions of the U.S. currently requires the disposal of much larger volumes of both flowback water from the stimulations themselves and produced water resulting from increased and expanded production, which could increase the hazard (CCST, 2014).

Under SB 4, hydraulic fracturing and fluid disposal are regulated by DOGGR through permit applications for well stimulation. Oil and gas developers would be required to comply with DOGGR's Well Stimulation Treatment Regulations, Section 1785.1, to monitor and cease hydraulic fracturing activities if an earthquake of Magnitude 2.7 or greater occurs within a radius of five times the maximum axial dimensional stimulation area (DOC, 2015). These regulations include cessation of hydraulic fracturing within the specified radius until DOGGR has completed the evaluation of whether there is a causal relationship between the detected earthquake and the hydraulic fracturing. The regulations under SB 4 would be implemented on BLM-administered land in California and would reduce potential effects of induced seismicity.

The CCFO has developed BMPs and SOPs related to geologic hazards and oil field development activities (Appendix D). These include:

- Civil engineering studies or geotechnical studies may be required to determine feasibility prior to road or other construction. Construction in areas of extremely unstable bedrock formations and active landslides will not be permitted or would require special design criteria.
- New wells and roads should be located in areas where cut and fill shall be minimized to the extent practicable.

4.3.3 Impacts of Alternative A (No Action)

Alternative A would utilize the 2015 RFD Scenario while continuing current management under the existing 2007 HFO RMP. The potential effects of drilling up to 37 new oil and gas wells would include oil and gas well drilling or construction of access roads and pipelines near or across active faults, grading access roads and drill pads on potential unstable slopes or existing landslides, and construction of facilities on potentially liquefiable or expansive soils. Induced-seismic effects of hydraulic stimulation are the same as those described in Section 4.3.2.

Mitigation Measures GEO-1 (Avoid Active Fault Zones), GEO-2 (Prepare an Earthquake Response Plan), and GEO-3 (Prepare a Geotechnical/Geologic Report) (see Appendix C) would apply to Alternative A.

Leases Subject to Settlement Agreement – Subalternative 1

The 14 non-NSO leases as identified in Hollister I and Hollister II would be issued and are located in areas with active faults, landslides and potentially unstable slopes, and potential expansive soils (described in further detail in Section 3.3.4). Potential geology impacts for these lease areas would be similar to those discussed for the larger Planning Area. Consequently, implementation of Mitigation Measures GEO-1, GEO-2, and GEO-3 would be required before granting the lease or be included as a lease stipulation.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impact would occur.

4.3.4 Impacts of Alternative B

Alternative B would limit leasing to existing oil and gas fields defined by DOGGR with 754,000 acres closed to leasing. The open areas could experience exploration by up to 32 new wells and would have the same potential for expansive soils and landslides as Alternative A although under slightly less acres of potential development of oil and gas leases. Alternative B has three small open lease areas near active faults.

Mitigation Measures GEO-1 (Avoid Active Fault Zones), GEO-2 (Prepare an Earthquake Response Plan), and GEO-3 (Prepare a Geotechnical/Geologic Report) (see Appendix C) would apply to Alternative B.

Leases Subject to Settlement Agreement

Under Alternative B, the majority of BLM-managed mineral estate that contain the 14 non-NSO leases would be closed to leasing. If new wells were drilled in the open areas over the next 15 to 20 years, they would have the same geologic hazard impacts and mitigation as Alternative A, Subalternative 1.

4.3.5 Impacts of Alternative C

Alternative C would limit leasing to high oil and gas potential areas with 394,400 acres closed to leasing. The open areas could experience exploration by up to 37 new wells and would have the same potential for geologic hazards as Alternative A.

Mitigation Measures GEO-1 (Avoid Active Fault Zones), GEO-2 (Prepare an Earthquake Response Plan), and GEO-3 (Prepare a Geotechnical/Geologic Report) (see Appendix C) would apply to Alternative C.

Leases Subject to Settlement Agreement

The 14 non-NSO leases as identified in Hollister I and Hollister II would be in areas open under this alternative. If new wells were drilled in the open areas over the next 15 to 20 years, they would have the same geologic hazard impacts and mitigation as Alternative A, Subalternative 1.

4.3.6 Impacts of Alternative D

Alternative D would limit leasing to Federal mineral estate underlying BLM surface estate areas with 655,400 acres closed to leasing. The open areas could experience exploration by up to 37 new wells and would have the same potential for strong ground shaking, expansive soil, and landslide hazards as Alternative A. Alternative D includes very limited lease areas near the potentially active Rinconada fault.

Mitigation Measures GEO-2 (Prepare an Earthquake Response Plan) and GEO-3 (Prepare a Geotechnical/ Geologic Report) (see Appendix C) would apply to Alternative D.

Leases Subject to Settlement Agreement

Under Alternative D, the majority of BLM-managed mineral estate that contain the 14 non-NSO leases would be closed to leasing. If new wells were drilled in the open areas over the next 15 to 20 years, they would have the same geologic hazard impacts and mitigation as Alternative A, Subalternative 1.

4.3.7 Impacts of Alternative E

Alternative E would allow leasing in Federal mineral estate outside of California DWR designated groundwater basins and sub-basins with 99,400 acres closed to leasing. The open areas could experience exploration by up to 37 new wells and would have the same geologic hazard impacts as Alternative A.

Mitigation Measures GEO-1 (Avoid Active Fault Zones), GEO-2 (Prepare an Earthquake Response Plan), and GEO-3 (Prepare a Geotechnical/Geologic Report) (see Appendix C) would apply to Alternative E.

Leases Subject to Settlement Agreement

The majority of the 14 non-NSO leases as identified in Hollister I and Hollister II would be in areas open under this alternative. If new wells were drilled in the open areas over the next 15 to 20 years, they would have the same geologic hazard impacts and mitigation as Alternative A, Subalternative 1.

4.3.8 Impacts of Alternative F

Alternative F would allow leasing in Federal mineral estate in all areas unless currently closed under the 2007 Hollister Field Office RMP with 67,500 acres closed to leasing. The open areas could experience exploration by up to 37 new wells and would have the same geologic hazard impacts as Alternative A.

Mitigation Measures GEO-1 (Avoid Active Fault Zones), GEO-2 (Prepare an Earthquake Response Plan), and GEO-3 (Prepare a Geotechnical/Geologic Report) (see Appendix C) would apply to Alternative F.

Leases Subject to Settlement Agreement

The 14 non-NSO leases as identified in Hollister I and Hollister II would be in areas open under this alternative. If new wells were drilled in the open areas over the next 15 to 20 years, they would have the same geologic hazard impacts and mitigation as Alternative A, Subalternative 1.

4.4 Hazardous Materials and Public Safety

This section addresses the U.S. Bureau of Land Management's (BLM's) Best Management Practices (BMPs) and Standard Operating Procedures (SOPs) for the proper management of hazardous materials to protect human health and the environment. This section also describes the types of potential impacts that Alternatives A through F could have related to hazardous materials on the environment and to public safety in the BLM Central Coast Field Office (CCFO) Planning Area. It addresses the types of mitigation that could be implemented to minimize impacts, where applicable.

4.4.1 Introduction

Approach to Impact Assessment

Oil and gas development involves extracting fluid minerals from the earth using various methods described in the Reasonably Foreseeable Development (RFD) Scenario (see Appendix B). The regional setting (see Section 3.4.3) and current conditions (see Section 3.4.4) reflect certain existing hazards of conditions associated with existing oil and gas production, well drilling, well stimulation treatments, transportation systems, and processing facilities.

The routine, non-routine, and accidental conditions associated with oil and gas development potentially pose a risk to the environment and public health and safety. Events outside the expected normal operating conditions (e.g., loss of well containment during drilling, or piping leak during production, release of toxic gas such as hydrogen sulfide, etc.) may take place. The hazards of both routine and non-routine conditions of oil and gas development activities are considered in this analysis.

This analysis reviews possible risks associated with the exposure to hazards, the use of hazardous materials, and possible generation of hazardous wastes. The analysis describes the potential risk of and impacts to the environment and public and worker safety. Hazards include conditions that could potentially affect worker health and safety and possibly the nearby public at large. Examples include exposure to hazardous materials, such as naturally occurring substances (e.g., asbestos and/or heavy metals), chemicals or hazardous waste, or to physically hazardous situations, as may occur in areas of high wildfire potential or in proximity to unstable slopes or landslides.

Management Common to All Alternatives

The discussion of effects on public health and safety in each alternative would be limited to areas where hazardous materials could be present due to oil and gas exploration or development activities, access to areas in terms of response time to hazardous materials releases, and vehicle traffic.

The existing 2007 HFO RMP established the following objectives to achieve goals for hazardous materials and public safety management:

- Identify and control imminent hazards or threats to human health and/or the environment from hazardous substance release on public lands (e.g., abandoned mine lands (AML) sites).
- Reduce hazardous waste produced by BLM activities and from authorized uses of public lands through waste minimization programs that include recycling, reuse, substitution, and other innovative, safe, cost-effective methods of pollution prevention.
- Ensure that authorized activities on public lands comply with applicable Federal, State, and local laws, policies, guidance, and procedures.
- Promote working partnerships with states, counties, communities, other Federal agencies, and the private sector to prevent pollution and minimize hazardous waste on public lands.

- Protect visitors from risks associated with AMLs and former military lands having unexploded ordnance from either safety hazards and/or environmental releases of chemicals of concern.

The Hazardous Materials and Public Safety Management Actions from the 2007 HFO RMP include:

- **HAZ-COM1.** Maintain an inventory of hazardous materials sites, including abandoned mine sites, BLM facilities, and former military facilities (i.e., Fort Ord).
- **HAZ-COM2.** Ensure that all BLM-authorized activities comply with Federal, State, and local hazardous materials laws and regulations.
- **HAZ-COM3.** Reduce the use of Federal funds for clean-up of contaminated lands by seeking cost avoidance and/or cost recovery from the legally responsible parties.
- **HAZ-C1.** Evaluate existing trails and roads for sediment production and drainage in areas where naturally occurring asbestos (NOA) and heavy metals are likely to be present.
- **HAZ-C2.** Conduct air quality analyses to determine the presence and potential exposure to NOA during common activities in an area of potential concern.
- **HAZ-C3.** Where NOA is present at hazardous levels, post signs and/or inform users that NOA is present, what the risks are, and how users can avoid exposure.

By design, BLM BMPs, Oil and Gas SOPs, and Implementation Guidelines (Appendix D) are in place to reduce the potential for public safety impacts during oil and gas exploration and production by implementing measures that require hazardous materials to be stored in sealed containers, prompt response to cleanup, the standardized use of drip pans and secondary containment, and the proper containment and disposal of produced water and flowback fluids following well stimulation activities. The SOPs and Implementation Guidelines include Subsection 1.8.5, which describes BLM requirements for drilling new wells. While these SOPs have a particular focus on reducing environmental impacts, some of the requirements also reduce public health impacts and safety hazards due to the presence (or expected presence) of hazardous materials. The following are examples of those requirements:

- All liquids shall be in closed, covered containers. Any spills of hydrocarbon/hazardous substances shall not be left unattended until clean-up has been completed.
- A spill prevention plan must be submitted to BLM prior to project approval for new wells, well completion or work-overs, installation of new facilities (buildings, tanks, pipelines, production equipment, etc.), routine maintenance activities and well abandonments. The prevention plan must identify a Spill Response Team, comprised of State and Federal emergency response agencies and provides contact numbers for each representative or representative agency.
- Install plunger lifts and smart automation systems, which monitor well production parameters to reduce methane emissions from well blowdowns.
- Reduce fugitive gas leaks by implementing a Directed Inspection and Maintenance program, which identifies and effectively fixes fugitive gas leaks using leak detection (e.g., infrared camera(s), organic vapor analyzer(s), soap solution, and/or ultrasonic leak detector(s)) and measurement (e.g., calibrated bagging, rotameters, high volume samplers). Note: Fugitive emissions are often a precursor of larger leaks.
- Require that operators obtain and maintain as current all required State and Federal permits for the protection of groundwater and surface water quality. Additional measures to protect water resources that may be included as Conditions of Approval (COA) could be specifically designed and applied by BLM to protect groundwater include; zone isolation, general casing depth and cement requirements, pressure testing, casing integrity testing, fluid surveys, and/or wellhead monitoring.

- Design roads, well pads, and facilities for exploratory wells to impact and fragment the least acreage practicable. New facilities shall be designed to maintain natural drainage and runoff patterns. Noncommercial wells shall be restored as soon as appropriate using BLM restoration methods.
- Timely plugging and abandonment of depleted wells will be required. This includes plugging the well bore with cement, removing all materials and equipment, and recontouring/revegetation of well site as specified in the conditions of approval.
- Sufficiently impervious secondary containment, such as containment dikes, containment walls, and drip pans, should be constructed and maintained around all qualifying petroleum facilities, including tank batteries and separation and treating areas consistent with the U.S. EPA Spill Prevention, Control, and Countermeasure regulation (40 CFR 112).
- The appropriate containment and/or diversionary structure would be sufficiently impervious to oil, glycol, produced water, or other fluid and would be installed so that any spill or leakage would not drain, infiltrate, or otherwise escape into the ground, surface, or navigable waters before clean-up is completed.
- Proper containment of oil and produced water in tanks, drilling fluids in reserve pits, and locating staging areas away from drainages would prevent potential contaminants from entering surface waters.
- Chemical containers should not be stored on bare ground or exposed to the sun and moisture. Labels must be readable. Chemical containers should be maintained in good condition and placed within secondary containment in case of a spill or high velocity puncture. All secondary containment must be designed to preclude entry from wildlife and livestock.
- Set and cement surface casings to sufficient depths to protect water bearing zones outside of the production zone(s).
- Consider the use of a closed loop drilling system. In the absence of a closed loop system, tanks and pits must be designed to preclude the entry of wildlife and livestock.
- Produced water from oil and gas operations would be disposed of in accordance with the requirements of Onshore Oil and Gas Order #7.
- Construction activities that disturb one or more acres of soil or less than 1 acre but are part of a larger common plan of development or sale having the potential to disturb one or more acres (includes clearing, grading, and ground disturbances such as stockpiling or excavation) are required to obtain coverage under the General Permit for Discharges of Stormwater Associated with Construction Activity (Construction General Permit, Order 2009-0009-DWQ) and manage construction in accordance with permit requirements.

Types of Impacts

Potential hazardous materials and public safety effects include the hazards associated with oil and gas exploration and production; risks associated with contact with produced fluids and well stimulation treatment chemicals; vehicular travel on county, BLM and operator-maintained roads; firearms accidents near oil and gas facilities during hunting season and by casual firearms use such as target shooting; and natural events such as range fires.

Areas with intensively developed oil fields that remain open to public access may result in the exposure of the public to a hazardous industrial environment including the dangers associated with hydrogen sulfide or methane gas and petroleum production. Active oil fields and active well sites are industrial areas where permissible public access would be carefully evaluated. In certain cases, access can be limited or restricted where active drilling, well stimulation, or other well workover activity is occurring.

This section considers the following types of hazards:

- A hazard to the public created through the routine transport, use, or disposal of hazardous materials.
- A hazard to the public created from changes in air quality, although concentrations of NOx, SOx, and/or ozone potentially above the National Ambient Air Quality Standards (NAAQS) (see Section 4.5, Air Quality).
- A hazard to the public created by increased vehicle traffic associated with oil and gas exploration and development including well stimulation activities.
- A hazard to the public created through conditions involving the increased risk of the release of hazardous materials (airborne and liquid spills).
- A hazard to the public created through conditions involving the increased risk of gas releases (toxicity/ flammability).
- A hazard to the public created by intensively developed oil fields that remain open to public access may result in the exposure to a hazardous industrial environment (toxic or flammable materials).
- Fracturing-induced seismic events (see Section 4.3, Geology).
- Oil leaks from field gathering and intrastate crude pipelines.

Key attributes that affect the indicators are:

- Number of wells and related infrastructure;
- Acres where oil and gas exploration and development could occur; and
- Response time to hazardous materials incidents or vehicle accidents.

BLM is unable to quantify impacts to hazardous materials and public safety from the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.4. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects to hazardous materials and public safety from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground.

The CCST report was unable to quantify increased risks to public safety from spills or hazardous materials releases associated with enhanced well stimulation techniques because reliable data cannot be obtained. The CCST study explains there is a general lack of monitoring [or data available] to make inferences regarding the effects of well stimulation techniques in California, and all that can be done is to review and summarize what has been observed in other states or the published literature. This information should be taken as background material, which can direct further monitoring and observation in California. Therefore, BLM's evaluation of such impacts is based upon theoretical approaches or research methods discussed in the CCST study and Section 3.4.

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of federal minerals in the Planning Area because the CCST report indicates the majority of oil and gas activity in the planning area entails conventional well drilling. The CCST report suggests the potential for future operations to include enhanced well stimulation techniques is low because previous attempts to extract resources using hydraulic fracturing have not been productive or economical. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and

the forecasted indirect effects of future leasing and development on resources in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

Assumptions

The analysis uses the following key assumptions:

- Hazardous materials and wastes are used and generated during oil and gas well development.
- With increased oil and gas exploration and development comes an inherent risk associated with an increase in the amount of hazardous materials used, generated, transported, and stored.
- While steam injection has been the primary enhanced oil recovery (EOR) technique applied to the fields, EOR and well stimulation treatments including hydraulic fracturing can be expected to be utilized.
- Oil and gas development may involve well stimulation treatments. For this analysis, hydraulic fracturing has been selected as the most likely well stimulation technology employed, since it involves the most logistics and potentially has the most health and safety impacts. Recent oil and gas activity in the CCFO Planning Area has involved only limited levels of well stimulation by hydraulic fracturing. In the Fresno County portion of the CCFO Planning Area, which has the highest level of well stimulation activity, 4 percent of recently producing wells indicate any record of previous hydraulic fracturing (see Appendix B, Table 2). No records of hydraulic fracturing were found for the Lynch Canyon and San Ardo fields.
- With the exception of San Ardo, the crudes from the CCFO Planning Area are considered sweet (<0.5% sulfur) or semi-sweet (<0.8% sulfur). Lacking information on the hydrogen sulfide concentrations in produced gas, we presume for the sweet crudes it is below the level where it poses a short-term acute health risk. A conservative value used for emergency response planning guidelines (ERPG) is 100 parts per million (ppm) for a 60 minute exposure or a dose of 6,000 ppm-min. For a 15-minute exposure, the concentration would be 400 ppm for the same dose. This analysis discusses the potential hazard, in the event the H_2S levels in produced gas may occur at higher levels (above 0.8% sulfur).
- Most of the exploration and production wastes generated during oil and gas exploration and development activities would be exempt from the Resource Conservation and Recovery Act (RCRA) hazardous waste regulations (e.g., produced water, produced oil, chemicals used for drilling and completion). Exempt waste material and debris from drilling would be classified as solid waste rather than hazardous materials because of the exemption for oil and gas exploration and development.
- Management of non-exempt hazardous materials, substances, and waste (including storage, transportation, and spills) would be conducted in compliance with 29 CFR 1910 (Occupational Safety and Health Standards), 49 CFR 100-185 (Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation), 40 CFR 100-400 (Protection of the Environment, EPA), Comprehensive Environmental Response Compensation and Liability Act (CERCLA), Oil Pollution Act (OPA), RCRA, Toxic Substances Control Act, Clean Water Act, and other Federal and State regulations and policies regarding hazardous materials management.
- The BLM's Hazard Management and Resource Restoration Program would respond to accidental surface releases of hazardous material on the BLM-administered public land. Containment and emergency cleanup actions would be implemented on sites posing a threat to the public safety and/or the environment.
- BLM's oil and gas inspection and enforcement program aids in reducing the risks associated with negligent release of hazardous chemicals into the environment.
- The population would continue to increase, and there would be a corresponding increase of use of public lands.

- Promotion of the areas within the CCFO Planning Area as vacation and outdoor recreational destinations by the public would continue and could potentially result in an increasing number of visitors encountering hazards on public lands.
- Vehicle traffic would increase in proportion to oil and gas exploration and development.

4.4.2 Impacts Common to All Alternatives

The RFD Scenario (i.e., between zero and 37 development and exploratory wells with approximately 206 acres of surface disturbance over the next 15 to 20 years on Federal mineral estate in the Planning Area) would occur under all of the alternatives, except Alternative B, which assumes up to 32 development wells with approximately 179 acres of surface disturbance. Therefore, any hazards and impacts related to gross well count (e.g., increased vehicle traffic, worker exposure, chemical use for well stimulation treatments) will be similar for all alternatives.

The well locations are unknown, but most development would be expected on existing leases near the Coalinga, Vallecitos, and San Ardo fields. The development may require up to 10 miles of new transmission pipeline to allow oil and gas production to be connected to existing transportation systems.

Natural Hazards and Hazards of Oil and Gas Development

During well drilling, hazardous materials such as equipment maintenance fluids and fuels, oil, and hydraulic fluid would be used and stored at the well site and nearby staging areas. During hydraulic fracturing, acid well stimulation, or EOR — additional hazardous chemicals including acid and fluid additives would be expected to be located on the proposed project site (e.g., activator, biocide, breaker, and surfactant) (DOC, 2015). Spills and leaks of hazardous materials during well drilling, well stimulation, and maintenance activities could result in impacts to soil or groundwater.

In oil and gas operations, as with most industrial activities, the general public typically is either physically excluded or not permitted on the project site. This reduces the potential for the public to be exposed to specific site hazards. Leases for oil and gas development in the CCFO Planning Area are typically in remote areas, which would limit the number of unauthorized visitors, or fenced so as to prevent unauthorized access. Natural hazards related to wildland fire may also occur in the oil field sites.

For workers employed at an oil and gas field site, there is the potential to be exposed to hazardous materials. Hazardous materials are those materials considered to be toxic, corrosive, flammable, reactive, irritating, and strongly sensitizing. The use of such hazardous materials may pose a threat to human health and/or the environment through routine emissions and/or accidental releases.

Additional hazards are posed by operations. These include vehicle and equipment accidents, equipment noise, direct electrical hazards from power lines and generators, and exposure to chemicals in commonly used products such as gasoline, paint, and cleaning agents. Hazards may also occur due to fire, explosion, fugitive natural gas emissions, and improper storage of hazard materials and/or wastes.

At work sites, hazards are commonly identified and described in written and approved on-site health and safety plans that include appropriate emergency procedures, telephone numbers, routes to the nearest hospital emergency room or trauma center, and mitigation measures. Prior to project commencement, operators will require health and safety plans to be read, discussed, and signed by all on-site workers and supervisors.

For the purposes of this environmental analysis, hazards and hazardous materials associated with oil well drilling and well stimulation treatment are analyzed and discussed, independent of location. It is assumed that new well drilling and well stimulation treatment methodology and chemicals used would be similar

across the CCFO Planning Area and similar to standard petroleum exploration and development practices in California.

Extraction of petroleum resources generally requires drilling of wells into the subsurface resources and basins to allow the oil and gas to flow to the surface by its own (using formation pressure) or in the case of oil from partially depleted fields, by pumping. Activities associated with oil and gas production include:

- Constructing well pads at the drill site
- Well drilling
- Well completion (e.g., perforation, cementing, stimulation, etc.)
- Commencing production
- Abandonment

Public Exposure to Hazards of Oil and Gas Operations

Areas with intensively developed oil fields that remain open to public access may result in the exposure of the public to a hazardous industrial environment including the dangers associated with hydrogen sulfide gas and petroleum production. As described in Section 3.4.3, the CCFO Planning Area is an area of heavy crude production that lacks substantial levels of natural gas production. Only one operator out of four in the Coalinga field reported any natural gas production in 2014 and for several years prior. Limited levels of gas production generally avoids the potential hazards of handling, processing, and transporting produced gas.

Oil and gas exploration and development are market-based cyclical businesses, with periods of high and low levels of activities. Therefore, an operator may decide to temporarily "shut in" producing wells and wait for conditions to improve. The highly viscous nature of most heavy crude oil common in the CCFO Planning Area, typical low well head pressures, and the relatively low corrosive properties of the fluids (low sulfur crude) make the known dangers of shutting in a well for long periods and then bringing it back online less of a mechanical problem in the CCFO Planning Area than in other producing regions of the country. Monitoring and supervising temporary abandonment of wells would be undertaken by DOGGR and BLM.

The following additional conditions may be required before the temporary abandonment of a producing oil and gas well, service well, or an injection well.

- **Zone Isolation.** The requirement to isolate the producing interval (General Requirement #4) is waived. This waiver is based on the information submitted with the application and the geologic data in *Volume II – California Oil and Gas Fields*, which may indicate the absence of usable water aquifers above the producing horizon.
- **Mechanical Integrity of Casing.** The mechanical integrity of the casing may be determined using a hydrostatic pressure test method.
- **Fluid Level Tests.** In accordance with the requirements of the State of California Idle Well Program, a fluid level test will be performed at two- to five-year intervals while the well is temporarily abandoned. Per 14 CCR 1723.9, the operator is to measure the fluid level in the well by a reliable means or by other diagnostic tests as approved by the Supervisor. The fluid level test is typically performed on idle wells and such wells need not be temporarily abandoned to conduct this test. A copy of the survey will be submitted to the BLM within five business days of the survey.
- **Monitoring of Wellhead Pressures and Temperatures.** Wellhead pressure and temperature will be continuously monitored while the well is temporarily abandoned. Any pressure/temperature change will be promptly reported to the BLM.

- **Isolation of the Producing Interval.** The producing interval shall be isolated by setting a plug in the casing within 100 feet above the producing interval if a rising fluid level, an increasing wellhead pressure, or an increasing wellhead temperature is detected. The plug could be either a retrievable or drillable-type bridge plug or a cement plug of at least 100 feet in length.

Closures of Oil and Gas Fields

As a further precaution, some public lands within existing oil and gas fields may be closed to public access. The rationale for the public closure of these intensively industrialized areas stems from a concern for public safety in these areas. Specifically, such areas could pose threats from exposure to high temperature piping and equipment, hydrogen sulfide gas, natural gas, and crude oil. Complete public closure could be determined to be the appropriate management tool for the protection of human health and safety, if other options, such as requiring all publics to receive the specialized training needed to be in these areas and use the required equipment (H_2S monitors, fire retardant clothing, etc.) were deemed infeasible and unenforceable. Any such closures would be determined on a case-by-case basis accounting for the nature of the hazard and level of risk. In addition to existing fields, public access should also be restricted near active exploratory well drilling sites and wells undergoing stimulation or maintenance to further protect the public. This may require temporary road closure, signage, and developing alternative routes

Release of Hazardous Materials

Airborne Hazards

Well blowout is an accidental event that can occur during a well stimulation treatment and result in immediate hazards to workers and the public. Such an event may result in a release of oil and gas to the environment. In the event there is a gas release during a blowout, the gas may travel downwind into populated areas depending on the location of the field with respect to the populated area and the direction and strength of the prevailing wind. If the flammable gas cloud encounters an ignition source, a flash fire at the well head can occur and possibly ignite any volatiles left in the spill of crude oil. Flash fires have the potential to cause acute health risks to oilfield workers and possibly the public. In addition, if the release contains sour gas — a toxic hazard is associated with the blowout. The use of properly designed blowout preventers (BOP) limits the duration of blowouts and subsequent hazards so that the direct effects of the blowout are generally limited. Well blowouts are relatively rare, or rarer than other events, such as casing failures and other construction-related defects providing the potential for directly relatable health risks.

There are many chemicals used during well stimulation treatments, including liquid acid mixtures and granular solids or sands for proppant. In combination, these chemicals and hydrocarbons can generate flammable mixtures that could under certain circumstances result in an explosion or fire if an ignition source were introduced. There have been a number of documented incidents where a blowout of a two phase stream of flammable gas/liquid resulted in the ignition of the resulting vapor cloud.

Blowout statistics for California oil and gas well drilling and production operations are collected by DOGGR. Four sources of blowout data were used for this study. DOGGR tracks surface well blowouts as a part of its mandate "to prevent, as far as possible, damage to life, health, property and natural resources" during "the drilling, operation, maintenance, and abandonment of wells" (PRC Section 3106). In response to this mandate, DOGGR generates three sources of data concerning blowouts (Jordan and Benson, 2008). DOGGR staff generates a published report using a standard form for each blowout. These data are typically entered into an electronic database. Additionally, DOGGR's "Annual Report of the Oil and Gas Supervisor" describes blowouts in the southern San Joaquin Valley region for study years between 1992 and 2006. In addition to data from DOGGR, staff at the Bakersfield Californian newspaper located all articles concerning blowouts during the 14-year study period: 32 blowouts were (uniquely) reported by only one source, 70 blowouts were reported by more than one source, and thus a total of 102 individual blowouts were identified.

Blowout statistics for the southern San Joaquin Valley (DOGGR District 4), as the largest hydrocarbon producing district in California, from 1991 to 2005, analyzed by Lawrence Berkeley National Laboratory (LBNL) for well drilling and work-over activities in non-thermal wells (Jordan and Benson, 2008), indicate the following:

- The frequency of blowouts during drilling or work-over is 0.0035/year per well or 1 in 28,000 wells for non-thermal wells.
- In the event of a blowout, 35 percent resulted in injuries and 15 percent resulted in environmental damage.
- Injuries ranged from sprains and abrasions to burns. No fatalities were cited for drill related blowouts, but one fatality was recorded by the overall data for drilling and operational well blowouts.
- Environmental damage consisted of various concentrations of oil covering 0.2 to 41 acres.
- No public impacts (as reported for Kern County) occurred during blowouts from these drilling activities; however, public impacts did occur from blowouts for the whole data set (thermal/non-thermal, drilling/ operational wells) and ranged from loss of electricity, to road closures, to evacuation of homes and a school.
- The average duration of a drilling or work-over blowout was 10 hours.
- The statistics described here (Jordan and Benson, 2008) also showed a steady decline in the number of blowouts per year from 11 per year in the early 1990s to one in 2005, whereas the average blowout rate per well covers the total period. These data indicate that well blowouts during well drilling and completion in some instances pose a major hazard to service company employees, albeit at a relatively low rate of occurrence.

These statistics are for overall oil and gas operations during drilling and work over operations, which precede completions including well stimulation. They would be applicable to new wells drilled to benefit from well stimulation treatment.

The release of sour gas (containing hydrogen sulfide) during a blowout has the potential to produce the most severe effects due to the toxicity of the hydrogen sulfide. Closures of offsite public areas as a result of blowouts may have been due to this specific hazard, since it has the most severe consequences in regard to human health and the difficulty related to containment. Most of the other hazards (e.g., fire, overpressure, oil contact) would be limited to the immediate vicinity of the damaged well. Operator emergency response planning documents should address public emergency evacuation situations (including those that may arise from blowouts) and procedures.

Per OSHA, hydrogen sulfide gas causes a wide range of health effects. Workers are primarily exposed to hydrogen sulfide by breathing it. The effects depend on the concentration of the hydrogen sulfide in atmosphere the individual is exposed to and the duration of the individual's exposure. Acute short-term exposure to very high concentrations can quickly lead to death (OSHA, 2005). A level of hydrogen sulfide gas at or above 100 ppm is Immediately Dangerous to Life and Health (IDLH) for a 30 minute exposure. At higher concentrations, hydrogen sulfide rapidly causes olfactory impairment. For most people, a concentration of 150 ppm is enough to immediately deaden the sense of smell. At a concentration of about 750 ppm or higher, inhalation of hydrogen sulfide gas can cause immediate collapse and unconsciousness.

Chronic long-term exposures can also result in health effects, and the threshold limit value for hydrogen sulfide is 5 ppm over 8 hours. Thus, workers in areas containing hydrogen sulfide must be monitored for signs of overexposure. Active monitoring for hydrogen sulfide gas and good planning and training programs for workers are the best ways to prevent injury and death. Thus, per API Recommended Practice 49, all drilling and/or servicing personnel should be trained in the potential dangers of hydrogen sulfide and precautions to be taken when it is encountered. Continuous hydrogen sulfide monitors/detectors should be available when drilling, workover or servicing a well with a potentially hazardous concentration

of hydrogen sulfide. Protective breathing equipment shall be located so that it is quickly and easily available (API, 2001).

Proppant consists of small granular solids such as sands and ceramic beads. Sand is delivered via truck and then loaded into sand movers, where it is transferred via conveyer belt and blended with hydraulic fracturing fluids prior to injection into the wellbore. Silica sand is used as a proppant in most of the hydraulic fracturing operations. The National Institute for Occupational Safety and Health (NIOSH) identified exposure to airborne silica as a health hazard to workers conducting some hydraulic fracturing operations during recent field studies. In normal use, well stimulation liquid chemicals are transported and stored in U.S. DOT approved totes, and in general, spills are normally limited in size and do not pose a serious acute health risk from inhalation exposure; surface water contamination is discussed separately.

NIOSH and OSHA identify seven primary sources of silica dust exposure during hydraulic fracturing operations (OSHA, 2012):

- Dust discharged from thief hatches on top of the sand movers during refilling operations while the machines are running (hot loading).
- Dust discharged and pulsed through open side fill ports on the sand movers during refilling operations.
- Dust generated by on-site vehicle traffic.
- Dust released from the transfer belt under the sand movers.
- Dust created as sand drops into, or is agitated inside the blender hopper and on transfer belts.
- Dust released from operations of transfer belts between the sand mover and the blender; and
- Dust released from the top of the end of the sand transfer belt (dragon's tail) on sand movers.

Breathing silica could produce silicosis, which potentially leads to lung disease causing inflammation and reducing the lungs ability to take oxygen. Several OSHA standards and directives cover operations that may expose workers to silica, including:

- Air Contaminants (29 CFR 1910.1000)
- Hazard Communication (29 CFR 1910.1200)
- Respiratory Protection (29 CFR 1910.134)

OSHA's Directive CPL 03-00-007, titled National Emphasis Program – Crystalline Silica, has detailed information on silica hazards, guidelines for air sampling, guidance on calculating Permissible Exposure Limits (PELs) for dust containing silica, and other compliance information.

Valley Fever is also a potential hazard for oil and gas field workers. Cal/OSHA has taken action to protect workers in the oil and gas industry — as well as wild land firefighters, geologists, agricultural workers, and others engaged in earth-moving work or exposed to dusty conditions — from Valley Fever. Workers in the oil and gas extraction industry in California risk contracting Valley Fever, which is caused by a microscopic fungus that lives in the topmost 2 to 12 inches of soil. A person can get Valley Fever if he or she breathes in the fungus (*Coccidioides immitis*) that causes the disease. The fungus grows in the soil. It gets into the air when the ground is broken and the dirt and dust spread into the air. People with jobs that require digging in the soil have the greatest chance of getting Valley Fever. Drilling and other activities have the potential of disturbing the ground and releasing dust and fungal spores into the air.

OSHA's October 2013 fact sheet, "Advice to Employers and Employees Regarding Work-Related Valley Fever," 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 (mainly the Central Valley of California), adopting site plans to reduce exposure, protecting workers against exposure with NIOSH-approved respiratory protection filters, training workers on the risks of Valley Fever, and more. The Morbidity and Mortality Weekly Report from Centers for Disease Control and Prevention dated March 29, 2013, reports an average annual increase of 13 percent in

the incidence of reported Valley Fever cases in California. 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. The number of new Valley Fever cases reported in California has increased dramatically in the last few years, according to the California Department of Public Health, presenting a significant 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.

Surface Water Contamination

All phases of oil and gas development, including geophysical surveys, well pad grading, well drilling, or well stimulation, involve use of hazardous materials such as vehicle fuels, oil, hydraulic fluid, and other vehicle maintenance fluids that are routinely used and stored in staging areas and at worksites. Gasoline, diesel fuel, oil, hydraulic fluid, lubricants, paints, solvents, adhesives, and cleaning chemicals used in construction activities, equipment, and vehicles could potentially be released during well drilling and maintenance as a result of accidents, and/or leaking equipment or vehicles. Spills and leaks of hazardous materials during drilling and maintenance activities could potentially result in soil or groundwater contamination. Drilling muds are generally nonhazardous mixtures of water, bentonite and other drilling mud additives. However, heavy metals (mercury, cadmium, arsenic, and hydrocarbons) may mix with the drilling fluid and be temporarily contained in the mud pits and waste pits. Fluids used during well stimulation, including EOR and hydraulic fracturing, as well as the flowback fluids or produced water are known to contain low to moderate levels of contamination by hazardous substances. Wastewater is routinely injected for well stimulation or disposed of in deep formation injection wells.

An accidental release of a potentially harmful or hazardous material into a dry stream bed or wash would not be expected to directly affect water quality. Similarly, an accidental spill or release of hazardous materials outside of a stream channel would not be expected to directly affect water quality. However, accidental spills or releases of hazardous materials into a dry stream bed or wash, or on the banks of a stream channel, could indirectly impact water quality through runoff during a subsequent storm event, when the spilled material would be mobilized into a drainage or waterbody. Analysis of the potential for an accidental spill or leak of hazardous materials to affect water resources is presented in Section 4.8 (Surface Water Resources).

Accidental spills or releases of hazardous materials could potentially impact groundwater through direct percolation and/or advection following a rainfall event. Hazardous material spills that are left on the ground surface for an extended period or that are followed quickly by a storm event could leach through the soil and into the groundwater, thereby resulting in the degradation of groundwater quality. The potential for these effects to occur as a result of the alternatives are addressed in Section 4.7 (Groundwater Resources) and Section 4.8 (Surface Water Resources).

A Storm Water Pollution Prevention Plan (SWPPP) would be required for grading and ground disturbance activities exceeding 1 acre. The SWPPP should include a project-specific Spill Prevention Plan (SPP), which is required per CCFO BMPs and SOPs, covering grading for access roads and drill pads, well drilling, and well stimulation. Well field staging yards and storage tank batteries containing greater than 1,320 gallons will require a Spill Prevention, Control, and Countermeasure (SPCC) Plan. The SWPPP, SPP, combined with a SPCC Plan, as well as implementation of BMPs related to fueling and the handling, use,

and storage of hazardous materials, and specific BMPs for well drilling and well stimulation, would mitigate accidental spills and leaks of hazardous materials. Preparation, approval prior to the start of site work (grading) or drilling, and compliance with such plans and BMPs would be included as part of each lease agreement in order to reduce the likelihood of spills.

California's program for well stimulation treatments under SB 4 (14 CCR Sections 1783.1 and 1786) requires the operators to include a Spill Contingency Plan, which accounts for all fluids, addresses handling of well stimulation fluid and additives, and includes steps for spill response in the event of an unauthorized release. Section 1786 of the SB 4 Well Stimulation Treatment Regulations also requires that operators be in compliance with all applicable testing, inspection, and maintenance requirements for production facilities that are storing and handling well stimulation fluids.

Chemical additives used in well stimulation fluid consist of a blend of common chemicals that increase water viscosity, help extend the fracture, and suspend/transport the proppant and water mixture farther out into the fractures. Table 4.4-1 lists the typical fluids used in hydraulic fracturing. Generally no more than three to eight chemical products are present at one time at any given site, and unused products are removed from the site by the service company when the treatment is complete.

Table 4.4-1. Typical Hydraulic Fracturing Fluid Additives

Additive Type	Typical Main Compound	Purpose
Activator	EDTA/Copper Chelate	Agent used to degrade viscosity
Biocide	Propionamide	Prevents or limits growth of bacteria
Breaker	Sodium Persulfate	Agent used to degrade viscosity
	Ammonium Persulfate	
Crosslinker	Borate	Developing viscosity
Gel	Polysaccharide	Gelling agent for developing viscosity
	Naphtha hydrotreated heavy	
Clay Control	Potassium Chloride (KCl)	Clay-stabilization additive which helps prevent clay particles from migrating in water-sensitive formations
	Alkylated quaternary Chloride	
Acid/base (pH) Adjusting Agent	Acetic Acid	Adjusts pH to proper range for fluid
	Potassium Carbonate	
	Sodium Hydroxide	
Proppant	Silica	Holds open fracture to allow oil and gas to flow to well
Surfactant	Ethanol	Aids in recovery of water used during fracturing
Water	Water	Base fluid creates fractures and carries proppant, also can be present in some additives

Source: DOC, 2015.

The contamination of drinking water aquifers by well stimulation, especially hydraulic fracturing, continues to be a public concern. The contamination could potentially occur from subsurface or surface migration of fracturing fluids during and after well completion. The Clean Water Act authorizes the National Pollutant Discharge Elimination System (NPDES) permit program to regulate the disposal of flowback fluids (following fracturing) into surface waters of the United States.

California SB 4 rules regulate the storage and containment of well stimulation treatment chemicals at the well site. SB 4 regulations require that recovered fluids be stored in containers but does not specifically require that the containers be enclosed. It does not allow the fluids to be stored in sumps or pits. In addition, SB 4 requires secondary containment for any production facilities in place for 30 days or more and a Spill Contingency Plan to be implemented immediately in the event of an unauthorized release. Additionally, SB 4 would not allow the recovered fluids to be stored in sumps or pits. These measures would reduce the

likelihood of contamination of drinking water aquifers. Finally, SB 4 requires groundwater monitoring on a well-specific, field-wide, or regional basis and the groundwater plans are subject to review and approval by the SWRCB. Therefore, while it is unlikely that there would be contamination due to the storage of the recovered fluids, groundwater monitoring would ensure any contamination would be found and addressed.

Chemical Confidentiality. One of the recommendations of the U.S. Department of Energy, Secretary of Energy Advisory Board (SEAB) Shale Gas Subcommittee's report is to provide disclosure of fracturing fluid compositions. The lack of such information has contributed to the public concern regarding the public risks of wells stimulation techniques. Regulations under California SB 4 (14 CCR Section 1788) require, among other public disclosures, a complete list of the chemicals and the maximum concentration of each and every chemical constituent of the well stimulation fluids used, so that a complete health study can be conducted. SB 4 requires the public disclosure within 60 days. Furthermore, operators are required to sample, analyze and submit the analysis to the DOGGR for all flowback fluid.

Temporary Storage. Under all alternatives except Alternative B, exploratory (wildcat) and field development drilling within the CCFO Planning Area during the next 15 to 20 years is estimated to reach 37 wells (Appendix B). Alternative B drilling could reach 32 wells. Consequently, the temporary storage, handling, and use of hazardous materials within one of the active oil fields or adjacent areas where exploration is likely, is not anticipated to require exceptional levels of response to leaks or spills. Well stimulation activities would also require temporary storage and use of hazardous chemicals (principally acid). All well drilling, well stimulation and field production facilities (storage tanks, separation and treating areas) would be required to follow BLM Implementation Guidelines, or BMPs and SOPs, for chemical storage including placement on impervious surface, secondary containment, drip pans, labels on all containers, and covered/sun shield storage. CCFO BMPs and SOPs (in Appendix D) outline the requirements to keep drilling pits free of hydrocarbons and to properly remove and dispose of contaminated materials and substances during site reclamation, including closing the drilling pits, and this would help to prevent accidental release of or public exposure to chemicals.

Subsurface Contamination

Underground injection is the most common method of disposing of fluids or other substances from shale crude oil extraction operations. Disposal of flowback fluids and produced water via underground injection is regulated under the Safe Drinking Water Act's Underground Injection Control (UIC) program. Injection wells that may be used for disposal of flow back water and other produced waters are classified as Class IID in EPA's UIC program and require State or Federal permits. The primary objective of the UIC program, whether administered at the State or Federal level, is protection of underground sources of drinking water (USDWs). There are two areas of concern regarding subsurface contamination of aquifers by hydraulic fracturing fluids:

- Underground loss of well integrity at the depth of the aquifer, and
- Formation fractures extending vertically and reaching the bottom of the aquifer.

Well Integrity. Regulations under SB 4 (14 CCR Section 1784.1) require well integrity testing. Additionally, regulations under SB 4 (14 CCR Section 1787) require monitoring of casing pressures after stimulation. According to Section 1784.1 of the regulations, all cemented casing strings and tubular strings utilized in well stimulation treatment operations are to be pressure tested for 30 minutes at a pressure equal to 100 percent of the maximum surface pressure anticipated during the well stimulations treatment. In addition, surface equipment must be tested to 125 percent of the maximum surface pressure anticipated during the well stimulation treatment, but no greater than the manufacturer's pressure rating for the equipment. Additionally, the well owner/operator must perform a radial cement evaluation and the integrity of the casing will be monitored during stimulation (Section 1784.2).

The regulations specify the requirements for well casing cementing depths to protect or minimize damage to usable groundwater. Regulations under SB 4 re-establish these requirements for well stimulation treatments and include additional requirements for cement quality and documentation. SB 4 requires the applicant to demonstrate that all usable water and other mineral-bearing formations would be isolated and protected from contamination. Continuous monitoring of casing annuli pressure during stimulation, and frequent monitoring after treatment can detect potential integrity problems and allow implementation of corrective actions before severe contamination of usable groundwater occurs. Additional SB 4 regulations (Sections 1784, 1785, and 1787) require data submission and well monitoring during these steps of the stimulation program.

Fracture Penetration of Groundwater Zone. Another concern has been that fractures induced by well stimulation may grow vertically, if the stresses in the formation are such that vertical fractures are possible and where present in oil fields, could extend into the usable groundwater zone. However, fractures in the deep zones tend to be vertical due to overburden pressures, while fracturing in shallower zones tend to be in the horizontal direction. The occurrence of usable waters in oil and gas fields vary significantly and can often be found within hydrocarbon zones. In some cases, the physical distances involved between the fracturing depth and the shallow aquifers used for drinking water precludes interaction between the fractures and the fresh waters. See Section 4.7 (Groundwater Resources) for information on the risks of fractured formations and contaminants affecting the groundwater zone.

Well Water Testing. Engineering controls and administrative procedures reducing risk to usable groundwater aquifers are discussed in Section 4.7 (Groundwater Resources). Baseline water testing is a BMP that the BLM encourages. The BLM may require water testing and monitoring, especially if water quality impacts are a substantial concern based on local conditions and where the BLM or a cooperating landowner or manager manages the surface estate where testing could yield useful water quality information. In addition, the regulations under SB 4 (Section 1783.3) ensure the availability of water testing of wells to land owners with wells used for drinking or irrigation water. The cost of the testing is to be borne by the operator.

Irrigation with Produced Water

California is the third largest generator of produced water behind Texas and Wyoming (U.S. DOI, 2011). The U.S. Department of Energy, SEAB Shale Gas Subcommittee's report investigated the management and beneficial uses of produced water in Western states, including irrigation and livestock water use. The report provides information from the Food and Agriculture Organization on constituent limits for irrigation water. The limits were set from the perspective of health of plant growth only. The mechanisms for the constituent entering the food chain were not addressed. There may be an opportunity to supplement irrigation water use with produced water in California, but more information on the risks to human consumption of the irrigated food is needed (SEAB, 2011).

Pressurized Gas Releases

Modern drilling practices control well pressure to keep oil and natural gas from escaping into the environment. The primary ways to control subsurface pressure is by circulating weighted drilling fluid (drilling mud) down the drilled hole, and sealing off the rock layers with steel casing and cement.

All well drilling incorporates basic well control measures to drill safely and protect the subsurface and surface environment. Basic well control relies on weighted drilling fluids to balance the pressures encountered while drilling to maintain control of the well at all times. Drilling fluid weight must be balanced against formation pressures. The weight cannot be too heavy not too light. Heavy drilling fluid can exert too much pressure against the formation with the possibility of fracturing the zone, or too little pressure which leads to loss of well control. Drilling fluid must be carefully balanced throughout the entire length of the well. Well control is furthermore enhanced with the required use of Blowout Prevention

Equipment (BOPE) placed on the top of the well and provides protection against blowouts and includes the ability to circulate out a "kick," which is subsurface fluid in the well that effectively reduces the weight of the drilling fluid column. An operator drilling on Federal mineral estate must submit an APD containing all the information required by Onshore Order 1, including minimum specifications for BOPE that will be used to keep control of well pressures encountered while drilling. Onshore Order 2 identifies the minimum requirements for BOPE and the minimum standards for testing the equipment. Additionally, well BOPE requirements are covered under 14 CCR Section 1722.5.

Blowout preventer equipment systems are comprised of a combination of various components. The following components are required for operation under varying rig and well conditions:

- blowout preventers (BOPs);
- choke and kill lines;
- choke manifolds;
- control systems;
- auxiliary equipment.

The primary functions of these systems are to confine well fluids to the wellbore, provide means to add fluid to the wellbore, and allow controlled volumes to be removed from the wellbore. These series of large valves and other devices installed on top of the well, allow drillers to manage pressure increases or close the well, if necessary. By closing and opening the appropriate valve or series of valves, the drillers can re-establish control of the well and adjust the drilling fluid weight to account for the increased pressure. Because BOPs are critical to the safety of the crew, the rig, and the well, they are inspected, tested, and refurbished at regular intervals. Due to the extensive development of some oil and gas reservoirs in the CCFO Planning Area, well pressures have declined in many locations.

Truck and Passenger Transportation

Vehicle traffic would increase in proportion to oil and gas exploration and development, although the incremental change under the RFD Scenario would be small. Routine oil and gas production throughout the CCFO Planning Area involves a baseline of activity (see Section 4.18, Transportation and Access). New well development and well stimulation treatments add truck and passenger traffic to California roads that increases hazards to the public either through vehicle movements or transportation of hazardous materials.

An example of the equipment used and level of activity during hydraulic fracturing activities appears in Table 4.4-2 below.

Table 4.4-2. Typical Equipment Used for Hydraulic Fracturing Activities

Equipment	Activity	Number	Duration of Use (days)
Control van	Fluid quality and data monitoring*	2	1 or 2
Pump truck	Pumping	4	1 or 2
Flatbed	Chemical storage (holds approximately 10 tote tanks)	1	1 or 2
Manifold/treating iron trailer	Hauls pipes	1	1 or 2
Tanker/mixer (5,000 gallon)	Gel storage and hydration unit	1	1 or 2
Blender	Blend fluid and proppant	1	1 or 2
Crane	Lifting heavy equipment	1	1 or 2
Sand chief (150 ton capacity)	Sand storage	1 to 4	5 to 7 days
Pickup truck or van	People/tools transport	2	1 or 2

Table 4.4-2. Typical Equipment Used for Hydraulic Fracturing Activities

Equipment	Activity	Number	Duration of Use (days)
Water tanks (500 barrel laydown tanks or 400 barrel upright tanks)	Water storage	8 to 15	5 to 7 days
Water trucks (4,000 or 5,000 gallon) (if not available via pipeline)	Supplies water	~50 to 63 round trips**	Prior to hydraulic fracturing activities
Sand trucks (25 ton capacity)	Hauls sand	8 to 20 round trips	Prior to hydraulic fracturing activities

Source: DOC, 2015.

* Workers in the monitoring van include individual personnel responsible for: (1) status of equipment; (2) monitoring blending; (3) engineering; (4) quality control of the fluid being pumped; and (5) observation (from the operator company).

** Approximately 5 to 10 million gallons of water is typically required for both exploratory drilling and hydraulic fracturing stimulation of the Monterey Formation, which would result in 1,000 to 2,000 round-trip truck trips to deliver water to the site.

To estimate the number of trucks required for proppant deliveries, the number of rail cars was first developed. For each well between 200-500 tons of proppant is delivered by rail, and all proppant rail deliveries are assumed to be into Bakersfield. 300 tons of proppant was assumed, which is the equivalent of three rail cars per well based on 100 tons per rail car. The proppant is delivered to the wells in 25-ton trucks, which results in 12 trucks for each well. An average distance was selected for each region depending on the location of the well fields from Bakersfield. The distances from Bakersfield to the well fields were determined by estimating the mileage on State or interstate highways. Table 4.4-3 shows the total maximum number of roundtrips and roundtrip miles by county and field as a proxy for possible well locations.

Table 4.4-3. Annual Proppant Deliveries and Roundtrip Miles

County / Field[1]	Stimulation Wells per Year	Roundtrip Miles from Bakersfield[2]	Roundtrips per year[3]	Roundtrip Miles per Year
Fresno / Coalinga	1	225	12	2700
Fresno / Jacalitos	<<1	225	0	nil
Fresno all traffic	1	225	12	2700
Monterey / Lynch Canyon	<<1	300	0	nil
Monterey / San Ardo	1	300	12	3600
Monterey all traffic	1	300	12	3600
Total	**2**	**—**	**24**	**6300**

1 - Fresno and Monterey Counties are anticipated to have hydraulically fractured wells.
2 - Distance from Bakersfield to the average location of well fields in region.
3 - Assumes 12 truck deliveries of proppant per well.

The well stimulation truck deliveries include stimulation water, water tanks, chemical additives, sand chiefs, and pumps/mixers. Trucks to haul solid waste are also needed. Two chemical flatbeds, two waste trucks, and four auxiliary trucks for equipment such as pumps and mixers were assumed per well. The roundtrips for water were 63 for both existing and new hydraulically fractured wells, shown in Table 4.4-2. The roundtrip miles for all categories except proppant were assumed at 50 miles per roundtrip at the region level. At the field level, the roundtrip miles were 10 miles for trips within the fields, based on an average field size.

The maximum number of roundtrips and roundtrip miles for stimulation water, chemical flatbeds, waste, and auxiliary equipment (pumps and mixers) is shown in Table 4.4-4. The largest number of roundtrips is for water, which as a conservative assumption, was assumed to be completely delivered by truck.

Table 4.4-4. Annual Number of Trips and Roundtrip Miles for Chemicals, Waste, Stimulation Water and Auxiliary Equipment

County / Field[1]	Stimulation Wells per Year	Water Truck Roundtrips[2]	Water Truck Roundtrip Miles[3]	Chemical Flatbed and Waste Roundtrips[4]	Chemical Flatbed and Waste Roundtrip Miles[3]	Auxiliary Truck Roundtrips[5]	Auxiliary Truck Roundtrip Miles[3]
Fresno / Coalinga	1	63	3,700	4	240	2	240
Fresno all traffic	1	63	3,700	4	240	2	240
Monterey / San Ardo	1	63	3,780[6]	4	240[6]	4	240[6]
Monterey all traffic	1	63	3780	4	240	4	240
Total	**2**	**126**	**7,560**	**8**	**480**	**8**	**480**

1 - Well stimulation treatments are expected in Fresno and Monterey Counties.
2 - Assumes 63 round trips based on Table 4.4-2.
3 - Assumes 50 miles roundtrip, except for fields.
4 - Assumes two chemical trucks and two waste trucks per well.
5 - Assumes four auxiliary trucks for pumps, mixers, blenders and crane per well.
6 - Roundtrip miles within these oil fields. Roundtrip miles for all oil and gas fields assumed at 10 miles based on the average field size.

Table 4.4-5 shows the maximum annual number of trips and roundtrip miles for workers, as well as trucks for sand chiefs and water storage tanks. The well stimulation activities were assumed at 7 days to estimate the roundtrips for workers. Fifteen roundtrips per day were assumed for the workers, and additional personnel such as the owner/operator were assumed at five roundtrips per day. Roundtrip miles for workers were assumed at 50 miles roundtrip. Four sand chiefs and 15 water tanks were assumed per well, and at 50 miles per roundtrip. The overall number of incremental roundtrips and miles traveled per year per county, as shown in Tables 4.4-3 through 4-4-5, would not represent a major increase over the level of activity in the setting.

Table 4.4-5. Annual Number of Trips and Roundtrip Miles for Well Workers, Water Tanks, and Sand Chiefs

Study County[1]	Stimulation Wells per Year	Roundtrips for Workers[2]	Roundtrip Miles for Workers[3]	Water Tank Truck Roundtrips[4]	Water Tank Truck Roundtrip Miles[3]	Sand Chief Truck Roundtrips[5]	Sand Chief Truck Roundtrip Miles[3]
Fresno / Coalinga	1	140	7,000	15	750	4	200
Fresno all traffic	1	140	7,000	15	750	4	200
Monterey / San Ardo	1	140	7,000	15	750	4	200
Monterey all traffic	1	140	7,000	15	750	4	200
Total	**2**	**280**	**14,000**	**30**	**1500**	**8**	**400**

1 - Well stimulation is expected in Fresno, San Benito, and Monterey Counties.
2 - The number of trips per day was assumed at 20 and well operations were assumed at 7 days.
3 - Roundtrip miles were assumed at 50 miles, except for fields.
4 - Assumes 15 water tanks per well.
5 - Assumes 4 sand chiefs per well.

Table 4.4-6 summarizes the annual mileage for WST activities based on two completions per year for all counties. The average mileage per trip is approximately 64 miles based on the total vehicle round trips from Tables 4.4-3 thru 4.4-5.

Table 4.4-6. Annual Mileage for WST Completions

Vehicle use	Miles
Proppant	6,300
Stimulate water	7,560
Chemicals	480
Auxiliaries	480
Water tanks	1,500
Sand chiefs	400
Workers	14,000
Total	30,720

Transportation of Crude Oil and Gas by Pipeline

The California State Fire Marshal's Hazardous Liquid Pipeline Risk Assessment report (CSFM, 1993) indicates that over a 10-year period (1981-1990) there were no injuries or fatalities associated with crude oil pipeline spills in California; no fatalities occurred with the recent crude oil spill due to a pipeline leak in Santa Barbara (May 19, 2015).

Failure of crude oil and produced gas pipelines results in an impact zone that is primarily a function of the pipeline operating pressure and the hydrogen sulfide content, rather than the throughput, with the effects minimized by safety features and activities conducted in response. The frequency of a release (leak or rupture) is primarily a function of the construction of the pipeline, the inspection and maintenance, operational practices, as well as third-party damage. The volume of the subsequent release is a function of the training of the operators as well as the design, construction and maintenance of the leak detection system. Pipeline leaks are most commonly a result of corrosion/ erosion, or third-party intrusion (e.g., San Bruno and San Bernardino incidents) to the pipeline. It should be noted that current technology cannot detect small pin-hole leaks in pipelines, which can be the source of long-term releases going undetected especially related to buried pipelines.

The RFD Scenario (in Section 5.3 of Appendix B) projects that 10 miles of new transmission pipelines could be constructed in the study period. The report does not specify whether the connecting pipelines would carry oil or gas. A produced gas pipeline is potentially more hazardous to the public due to its flammable and possibly toxic (hydrogen sulfide) characteristics. As discussed with the Assumptions, the hydrogen sulfide concentration for some produced gas in the CCFO Planning Area may be sufficiently low so as to not pose an acute health risk to the public.

Unconfined vapor cloud explosion (UVCE) and flash fire are potential hazards of produced gas. The occurrence of an UVCE depends on the amount of natural gas liquids (NGLs) in the gas. An UVCE is not likely if the NGL concentration is under 10 percent and there is not confinement. The flash fire hazard is present when the gas release does not immediately ignite and a flammable gas cloud spreads and ultimately ignites. The thermal radiation from a flash fire is intense for someone nearby and can cause serious burns and potentially a fatality.

The total length of the expected new pipelines is relatively short, which reduces the potential for a loss of integrity scenario. Also, thermal recovery wells (generally required in the CCFO Planning Area) have little associated gas, so it is more probable that the new pipelines will be for crude oil transfer. As discussed above, the BLM may consider limiting public access to some areas within the leases that are considered higher risk, such as piping handling sour gas.

Other Risks and Hazards

There could be health effects associated with air emissions from project-related vehicles, firearm accidents, natural disasters and fugitive dust from roads and from the application of dust control treatments. Fugitive dust could reduce other visibility in localized areas and could increase the potential for vehicle accidents in the Planning Area.

The potential for firearms-related accidents would be expected to occur primarily during hunting season. The increased activity during drilling and field development would be likely to discourage hunting in the

immediate vicinity of oil and gas exploration and development during that period. Consequently, the risk of firearms-related accidents should be minimal. During project operations, the relatively few personnel on-site would experience only highly localized risk of firearms-related accidents from recreational target shooting or hunting activities.

Under any alternative, future oil leases located within Fort Hunter Liggett will require Conditions of Approval or stipulations that all ground disturbance areas (access roads and drill pads) shall be screened and, if necessary, cleared of munitions and explosives of concern.

The risk of wildland fires could increase in areas associated with oil and gas construction activities, due to vehicle collisions, industrial development, and the presence of fuels, storage tanks, natural gas pipelines, and gas production equipment. Fire suppression equipment, fencing and netting of pits, a no-smoking policy, shutdown devices, and other safety measures typically incorporated into gas drilling and production activities would reduce the risk to public health and safety. There could be an increased risk of wildland fires ignition where construction activities place welding and other equipment in or near vegetation. Adherence to relevant safety regulations by operators and enforcement by the respective agencies would reduce the probability of wildland fires ignitions.

Both workers and the public could be exposed to naturally occurring hazardous materials that are found in the soil throughout the CCFO Planning Area, such as asbestos found in serpentine soils and mercury, chromium, and other heavy metals found in soils surrounding past mining operations (BLM, 2013). These materials also can be found at a distance from past mining operations because some of these naturally occurring hazardous materials have been eroded and transported via stormwater runoff to downstream depositional areas (BLM, 2013). Oil and gas production activities would result in soil disturbance and could mobilize these naturally occurring hazardous materials. Workers and the public potentially could be exposed to these mobilized hazardous materials either through direct contact or through inhalation of airborne particles.

4.4.3 Impacts of Alternative A (No Action)

Alternative A would utilize the 2015 RFD Scenario while continuing current management under the existing 2007 HFO RMP (BLM, 2007).

Release of Hazardous Materials

Drilling, field development and production activities associated with oil and gas exploration and development require use of a variety of chemicals and other materials, some of which would be classified as hazardous, including drilling muds and additives for completion and EOR and hydraulic fracturing activities. These fluids could contain various contaminants such as salts, acids, mercury, cadmium, arsenic, and hydrocarbons, among others, which, if not managed correctly, could leach into soil and directly impact groundwater quality by down-hole releases. The runoff of contaminants into surface water could potentially impact surface water and/or groundwater quality. Potential impacts associated with hazardous materials include human contact, inhalation or ingestion and the effects of exposure, spills, or accidental fires on soils, surface and groundwater resources, and wildlife. Operators of well stimulation treatments would be required to file information to DOGGR that is required by SB 4.

Development in ROWs (e.g., along road shoulders) and in designated corridors could affect public health and safety by inadvertently providing access to areas that could contain hazardous materials or authorizing surface-disturbing activity near these areas. Public health and safety would continue to be protected because site-specific authorizations or designations would not be issued in areas that would jeopardize remediation activities.

Soil or groundwater contamination could result from accidental spill or release of hazardous materials during oil and gas exploration and development, facility operations or during maintenance of the pipelines

and other utilities. Spills or releases could result in contamination to soil and/or groundwater and exposure of maintenance workers and the public to hazardous materials. In the event of a hazardous materials release, BMPs (Appendix D) would reduce the potential for contamination and exposure of workers or the public to hazardous materials.

In general, the population centers in the foreseeable development areas are not intermingled with the oil and gas properties. The towns of San Ardo and Bradley in Monterey County are a respectable distance from the producing areas. The petroleum fields are closer in the case of Coalinga in Fresno County, but in the absence of significant gas production, the effect would still be minor.

The risk of human contact with hazardous materials would be limited predominantly to operators and contractor employees. A Hazard Communication Program, Spill Prevention Control and Countermeasures Plans, and other mitigation measures would reduce the risk of human contact, spills, and accidental fires, and provide protocols and employee training to deal with these events should they occur (Appendix D).

Managing some acreage of the BLM-administered mineral estate as closed to oil and gas exploration and development would reduce occupational hazards, exposure to hazardous materials and vehicle traffic associated with oil and gas exploration and development in these areas. In addition, the potential for hazardous material exposure would be reduced or eliminated in areas managed with No Surface Occupancy (NSO) stipulations. Please see Chapter 2, Section 2.5.1, for a description of lease stipulations, including the NSO stipulation.

Hazardous material impacts would be avoided or reduced by the implementation of the BMPs outlined in Appendix D. Federal and State operating and reporting requirements include provisions to clean up and mitigate spills or releases of chemicals, products, or wastes. Hazardous Substances Management Plans would be developed and implemented by the oil and gas companies to prevent spills and illegal dumping of hazardous substances, pesticides, and wastes. It is assumed that the storage, use, and transport of these materials and the disposal of generated wastes would comply with all pertinent Federal regulations. BLM SOPs and DOGGR regulations include well abandonment practices to mitigate loss of containment of depleted wells.

Reclamation of areas disturbed by oil and gas exploration and development would reduce erosion, stabilize sites and improve vegetation cover. Reclamation would reduce exposure and movement of contaminated soils. Reclamation activities could also restore watershed function and indirectly help maintain water quality and reduce effects to public health.

Transportation by Pipeline

In areas containing surface or near-surface pipelines, individuals could be exposed to hazardous materials if there were a leak or a failure. The risk of leak or failure could be higher in the vicinity of road crossings or areas likely to be disturbed by road maintenance activities. Compliance with signing requirements for pipeline ROWs and posting markers at frequent intervals along the pipelines would reduce the likelihood of pipeline ruptures caused by third party excavation equipment. The remoteness of many projects and the low level of anticipated non-project-related construction and excavation would reduce the risk to public health and safety. Routine monitoring would reduce the probability of effects to health and safety from ruptures by facilitating the prompt detection of leaks.

Managing areas as closed to oil and gas exploration and development or with NSO stipulations could shift the location of pipelines and other utilities to other areas. This could concentrate the placement of pipelines and utilities and increase the risk of hazardous materials exposure in concentrated areas. Concentrating the placement of oil and gas activities and development also could decrease the emergency response time and leak detection time, and could reduce the number or size of hazardous material releases if co-location results in additional personnel inspecting and reviewing pipelines and utilities or more quickly becoming aware of leaks, spills, releases, or emergencies.

The RFD Scenario considers the addition of 10 miles of new interconnecting pipelines, which will most likely be located in existing ROWs (e.g., along road shoulders) to minimize surface land disruption. As indicated above, such pipelines (including road crossing) could expose the public to contacting hazardous material releases, including hydrogen sulfide in the case of a sour gas line.

Occupational Hazards

Health and safety impacts to operators, contract workers, and other public land users could result from industrial accidents. Increased oil and gas exploration and development would result in an increased potential for accidental releases and/or worker incidents. Drilling operation plans approved by the BLM would address the potential for the accidental release of hazardous materials. Adherence to relevant safety regulations by oil and gas operators and enforcement by the respective agencies would reduce the probability of accidents

The estimated oil and gas round trip traffic volume from well pad exploration and development is presented in Tables 4.4-4 and 4.4-5. The traffic volume from oil and gas vehicles on resource roads, local roads, collector roads, county road and State highways could increase the potential for accidents on roads with both public and oil- and gas-related motor vehicle traffic. Reducing fugitive dust on these roads would help maintain visibility for drivers and could indirectly reduce the potential for vehicle accidents in localized areas. The estimated vehicle round trips per well pad during construction and production would range from 0, when no oil and gas activity is occurring, to 795 round trips per well for drilling and completion of a well pad (BLM, 2015, pg. 4-598). Considering WST as a type of completion activity, WST activities could add another 172 round trips assuming some worker miles are already accounted for in the construction/production trips, for 967 round trips per well. Assuming approximately two new wells per year, the average annual total round trips for all counties would be 1,934 per year. For the total life of the RFD Scenario with 37 development and exploratory wells, 35,780 round trips would occur. Using an average of 64 miles per trip (estimated from Tables 4.4-3 thru 4.4-5), this gives a total of 2.29 million miles for the total life of the RFD Scenario.

The 2010 through 2012 average accident rate from the Department of Transportation's National Highway Traffic Safety Administration (NHTSA) for Fact Sheet Heavy Trucks was used (NHTSA, 2014). Since accident data for light trucks was not located, and since light trucks were a relatively small amount of the truck traffic, its rate was assumed to be similar to heavy trucks.

Since the accident rate is given as 24 accidents per 100 million miles, there was only enough traffic in the alternatives to have a fraction of one accident for all counties. Spread over two or more counties, the accident rate is negligible over the life of the plan. Using the truck accident rate, there was not enough estimated vehicle mileage to forecast an accident for any of the alternatives during the life of the RFD Scenario.

Impacts Mitigated by Stipulations and Recent Regulations

The acreage open in Alternative A for oil and gas development would not be specifically subject to BLM CSU stipulations that apply for all other alternatives. The primary CSU stipulation applicable to this assessment of public impacts is CSU-Well Stimulation Treatment contained in Appendix C. Alternative A utilizes the existing 2007 HFO RMP to ensure that authorized activities on public lands comply with applicable Federal, State, and local laws, policies, guidance, and procedures. Hence, while BLM CSU stipulations are not specifically applied, DOGGR regulations regarding well stimulation treatments would be invoked, which would have the same effect as the CSU stipulation for well stimulation treatment.

Given the following attributes, minor impacts would be likely due to the:

- low level of foreseeable oil and gas development per RFD Scenario;
- generally heavy, sweet crude characteristics with limited produced gas;

- low population densities around BLM acreage; and
- 2007 BLM HFO RMP practices and Federal and State regulatory requirements.

Mitigation Measures PS-1 through PS-6 (see Appendix C) include the types of measures that could be implemented to lessen the degree of potential adverse public safety impacts from development of oil and gas leases under Alternative A. During review of whether to accept or deny project proposals, BLM managers can decide to attach additional stipulations or measures, such as the following, to minimize or avoid potential health and safety effects.

Leases Subject to Settlement Agreement – Subalternative 1

The 14 non-NSO leases as identified in Hollister I and Hollister II would be issued. These leases are located in a historically nonproductive wildcat area west of San Ardo field (Leases CACA 052960, 052959, 053825, 053824, 053827, and 053826) (DOGGR, 2007) and in or near the Vallecitos oil field (Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828). Well drilling and other field development activities in these leases or new facilities in the Vallecitos field may occur, which would be within or nearby to areas of potential contamination/hazards identified by the Department of Toxic Substances Control data management system (EnviroStor). Potential hazardous materials and public safety impacts for these lease areas would be similar to those described in Sections 4.4.2 and 4.4.3.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impact would occur.

4.4.4 Impacts of Alternative B

This alternative is the most restrictive of all the alternatives for closures of some Federal mineral estate to oil and gas leasing and development. The acreage open to oil and gas leasing and development is reduced from 683,800 acres to a little less than 39,000 areas. This elimination of available acreage would result in co-location of oil and gas activities and facilities into a much smaller area. The effect would be to concentrate the risk of hazards impacting the public to specific localities. This would tend to confine the impacts to the public to areas of existing oil and gas production and active fields. The open areas could experience development by up to 32 new wells and would have the same potential for hazardous material releases as Alternative A. However, the expected emergency response times should be shortest (best) in this alternative due to the relative co-location of oil and gas activities.

Alternatives B thru E, when compared with Alternative A, would include more areas for closures or areas with NSO stipulations. The greater areas of closures could result in the concentration of oil and gas exploration and development activities in areas managed with standard lease terms and conditions and CSU stipulations. As such, the potential for hazardous material exposure in localized areas could increase marginally under Alternatives B thru E compared with Alternative A, depending on the options for closing Federal mineral estate to development.

Alternatives B through F would include CSU stipulations on Federal mineral estate open to leasing. Stipulation CSU-WST (Appendix C) requires operators meet BLM data requirements by providing it with information required by California State Senate Bill 4 (SB 4). Applicable SB 4 information includes, but is not limited to, the permit application, Water Management Plan, Water Monitoring Plan, and the final State-approved (stimulation) permit.

The other impacts and mitigations are expected to be the same as for Alternative A. Mitigation Measures PS-1 through PS-6 in Appendix C include the types of measures that could be implemented to lessen the degree of potential adverse public safety impacts from oil and gas leases associated with Alternative B.

Leases Subject to Settlement Agreement

Under Alternative B, the majority of BLM-managed mineral estate that contain the 14 non-NSO leases would be closed to leasing. If new wells were drilled in the open areas over the next 15 to 20 years, the potential hazardous material and public safety impacts and mitigation would be the same as Alternative A, Subalternative 1.

4.4.5 Impacts of Alternative C

Alternative C strikes a balance between land open (368,800 acres of high oil and gas occurrence potential) and closed (394,400 acres of moderate to low potential) to oil and gas leasing and development. This alternative also has almost 30,000 acres of open acreage with a NSO stipulation. The open areas could experience development by up to 37 new wells and would have the same potential for hazardous material releases as Alternative A. Under certain local geological circumstances, any oil and gas resources on this acreage might be accessed by directional drilling for leases without NSO stipulations. The open areas would have CSU stipulations. The impacts to the public are not expected to be significantly different from Alternative A.

Mitigation Measures PS-1 through PS-6 in Appendix C include the types of measures that could be implemented to lessen the degree of potential adverse public safety impacts from oil and gas leases associated with Alternative C.

Leases Subject to Settlement Agreement

The 14 non-NSO leases would not be likely to experience the full scope of the RFD Scenario. However, the potential hazardous material and public safety impacts and mitigation would be the same as Alternative A, Subalternative 1.

4.4.6 Impacts of Alternative D

Alternative D is similar to Alternative B with a large portion of the acreage (655,400 acres) being closed to oil and gas leasing and development. Being less restrictive than Alternative B, Alternative D would be beneficial as there would be less concentration of oil and gas activities to a relatively small percentage of the CCFO Planning Area acreage. This alternative also has 16,400 NSO acres. The open areas could experience development by up to 37 new wells and would have the same potential for hazardous material releases as Alternative A. The impacts to the public are not expected to be significantly different from Alternative A.

Mitigation Measures PS-1 through PS-6 in Appendix C include the types of measures that could be implemented to lessen the degree of potential adverse public safety impacts from oil and gas leases associated with Alternative D.

Leases Subject to Settlement Agreement

The 14 non-NSO leases would not be likely to experience the full scope of the RFD Scenario. However, the potential hazardous material and public safety impacts and mitigation would be the same as Alternative A, Subalternative 1.

4.4.7 Impacts of Alternative E

This alternative increases the acreage closed to oil and gas leasing and development by approximately 32,000 acres more than Alternative A, but leaves close to a half million acres still open. This alternative has the most acreage (206,400 acres) with NSO restrictions. The open areas could experience development by up to 37 new wells and would have the same potential for hazardous material releases as Alternative A. The impacts to the public are not expected to be significantly different from Alternative A.

Mitigation Measures PS-1 through PS-6 in Appendix C include the types of measures that could be implemented to lessen the degree of potential adverse public safety impacts from oil and gas leases associated with Alternative E.

Leases Subject to Settlement Agreement

The 14 non-NSO leases would not be likely to experience the full scope of the RFD Scenario. However, the potential hazardous material and public safety impacts and mitigation would be the same as Alternative A, Subalternative 1.

4.4.8 Impacts of Alternative F

This alternative has the same acreage closed to oil and gas leasing and development as Alternative A, and slightly increases the acreage with NSO restrictions compared to Alternative A. The open areas could experience development by up to 37 new wells and would have the same potential for hazardous material releases as Alternative A. The impacts to the public are not expected to be significantly different from Alternative A.

Mitigation Measures PS-1 through PS-6 in Appendix C include the types of measures that could be implemented to lessen the degree of potential adverse public safety impacts from oil and gas leases associated with Alternative F.

Leases Subject to Settlement Agreement

The 14 non-NSO leases would not be likely to experience the full scope of the RFD Scenario. However, the potential hazardous material and public safety impacts and mitigation would be the same as Alternative A, Subalternative 1.

4.5 Air Quality and Atmospheric Conditions

This section addresses impacts to air quality from activities allowed under the RMPA alternatives. The primary air quality impacts that can be reasonably expected to occur are emissions of combustion products and particulate matter from oil and gas development and production. This section describes the types of potential impacts the RMPA alternatives could have on air resources in the BLM Central Coast Field Office (CCFO) Planning Area, and it addresses the types of mitigation that could be implemented to lessen the degree of the impacts, where applicable.

4.5.1 Introduction

Approach to Impact Assessment

The RMPA alternatives would allow oil and gas development in some areas of the CCFO Planning Area. Oil and gas development involves extracting materials from the earth using various methods, and these are described in the Reasonably Foreseeable Development (RFD) Scenario (see Appendix B).

Extraction of petroleum resources generally requires preparing the site, drilling, installing well equipment, and storing or transporting the resource off-site. These processes produce air pollution in the form of engine exhaust emissions and fugitive dust from the transport of materials and the movement of vehicles over unpaved areas. Additional air pollution may be produced at extraction sites that include a facility for treatment or processing of the extracted oil and gas or byproducts of oil and gas extraction. Also, fugitive emissions of hydrocarbons would include volatile organic compounds (VOC), along with methane and hydrogen sulfide (H_2S) entrained in the oil and gas, and these emissions may occur at wellheads through leaking valves or behind casing in idle oil and gas wells.

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. Facilities that do not include stationary sources of air pollution may not require an air permit. The permit rules provide for an evaluation of air quality impacts for the proposed activity, and the activity must be deemed acceptable by the administering APCD before an air permit would be approved.

There is one management goal relevant to Air Quality and Atmospheric Conditions from the 2007 HFO RMP that is restated here:

- The goal for air quality management under the Resource Management Plan (RMP) is to ensure that BLM authorizations and management activities comply with local, State, and Federal air quality regulations, requirements, State Implementation Plans (SIPs), and Regional Air Board standards and goals.

The Area-wide Air Quality Management Actions from the 2007 HFO RMP include:

- **AIR-COM1**. Incorporate mitigation for activities and projects on BLM lands in order to comply with applicable Federal, State, and local air quality regulations.
- **AIR-COM2**. Manage motorized vehicle travel on dirt roads to minimize air pollution from dust and exhaust by restricting vehicle types and seasons when vehicles could be used.

Three measures to protect air quality, which include one Additional Mitigation Measure, are identified as Management Guidance in the Oil and Gas Stipulations (Appendix D of the 2007 HFO RMP):

- Measures to Protect Air Quality: (A) All oil and gas exploration and development activities that require off-road vehicle use or surface disturbance would be required to obtain an air quality emission permit or verification that such permits are not appropriate from the regional air quality control board.

- Measures to Protect Air Quality: (B) All oil and gas exploration and development activities resulting in surface disturbance or requiring the use of motorized vehicles would be required to suppress fugitive dust emissions from paved and unpaved surfaces in accordance with local APCD regulations.
- Additional Mitigation Measure: (A) Air modeling studies per the requirements of the Monterey Bay Unified Air Pollution Control District Rule 207 would be required before any emissions are allowed on leases in the Pinnacles National Park.

BLM Best Management Practices/Standard Operating Procedures for air quality (Appendix D) could reduce emissions of dust and other air pollutants during oil and gas production by implementing techniques for controlling road dust and for reducing, capturing, and/or controlling vapors, leaks, fugitives, and other emissions related to energy development.

Types of Impacts

Oil and gas development activities could result in emissions causing air quality impacts if they:

- Exceed any air quality standard, contribute substantially to an existing or projected air quality violation, or result in a cumulatively considerable net increase of any criteria pollutant for which the geographic area is in nonattainment under an applicable Federal or State ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors);
- Exceed *de minimis* threshold values for pollutants in nonattainment or maintenance areas;
- Conflict with or obstruct implementation of an applicable air quality plan;
- Expose sensitive receptors to substantial pollutant concentrations; or
- Affect long-term air quality as a result of operation and/or maintenance activities.

BLM is unable to quantify impacts to air quality and atmospheric conditions from the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.5. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects to air quality and atmospheric conditions from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground. Other incomplete or unavailable information includes the type(s) of development(s) and site-specific resource conditions because it's impossible for BLM to know how, where, or when leases would be developed.

BLM is unable to quantify impacts to all air basins, or Class I areas, from the range of alternatives because the timing, intensity, and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is based on the RFD Scenario, current resource conditions described in Section 3.5, and theoretical approaches or research methods discussed in the Air Quality Technical Support Document (Appendix K).

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of federal minerals in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99 percent) of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. The CCST report also indicates the majority of oil and gas

activity in the planning area entails conventional well drilling. The CCST report suggests the potential for future operations to include enhanced well stimulation techniques is low because previous attempts to extract resources using hydraulic fracturing have not been productive or economical. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects of future leasing and development on resources in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

Assumptions

All activities must 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 air pollutant emissions sources would coordinate with the local air permitting authority to seek necessary entitlements for oil and gas development including the completion of all necessary project-level environmental review requirements. Based on the results of the environmental review, the operator of emissions sources would implement all feasible mitigation measures identified in the environmental document to reduce or substantially lessen any significant air quality impacts of the project.
- 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 air quality jurisdiction and from other applicable agencies, if appropriate, prior to mobilization.
- The operator of emissions sources would comply with the Clean Air Act and the California Clean Air Act, including the applicable determinations for project-specific Best Available Control Technologies within the New Source Review (NSR) process, New Source Performance Standards, and National Emission Standards for Hazardous Air Pollutants.
- The operator of emissions sources would comply with local plans, policies, ordinances, rules, and regulations regarding air quality-related emissions and associated exposure (e.g., avoiding nuisances related to fugitive dust particulate matter or odors, providing payment into off-site mitigation funds if determined to be necessary as a result of a project-level environmental review or NSR process).
- Any project that is anticipated to result in emissions that constitute a "major source" would be reviewed for potential impacts to sensitive receptors, including mandatory Federal Class I Areas. This would be completed at the site-specific NEPA stage.
- 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 RFD Scenario, 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.

4.5.2 Impacts Common to All Alternatives

The RFD Scenario (i.e., between zero and 37 development wells with approximately 206 acres of surface disturbance over the next 15 to 20 years on Federal mineral estate in the Planning Area) would occur under all of the alternatives, except for under Alternative B, which assumes up to 32 development wells (approximately 179 acres of surface disturbance). The BLM prepared a Technical Support Document to analyze the effects to air quality of the alternative management approaches, and the Final Air Quality Technical Support Document reflects the interagency review and comments received from the Air Quality Technical Working Group (BLM, 2019). The Air Quality Technical Support Document appears as Appendix K of this Proposed RMPA/Final EIS.

For all alternatives, oil and gas exploration and development could occur anywhere that is open to oil and gas leasing within the CCFO Planning Area, although the most likely areas of development are on Federal

mineral estate either in the North Central Coast air basin or in the San Joaquin Valley air basin. All oil and gas development activities would be subject to either the jurisdiction of either the MBUAPCD or SJVAPCD, depending on the location. The history of activity for oil and gas exploration and development on Federal mineral estate within the CCFO Planning Area portion of the San Francisco Bay Area air basin is limited, and for this reason, little or no new oil and gas activity or emissions is anticipated in the BAAQMD portion of the CCFO Planning Area.

For all alternatives, leases subject to the settlement agreement for Hollister I and Hollister II occur in the North Central Coast air basin and in the jurisdiction of the MBUAPCD. There are no leases subject to the settlement agreement located in the San Joaquin Valley air basin or the San Francisco Bay Area air basin.

Air Pollution Sources Associated with RFD Scenario

Anticipated emissions from oil and gas development include direct emissions of oxides of nitrogen (NOx), sulfur oxides (SOx), volatile organic compounds (VOC) and reactive organic gases (ROG), which are precursor emissions for ozone and PM2.5, carbon monoxide (CO), respirable particulate matter (PM10) and fine particulate matter (PM2.5). These emissions are associated with 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 lift equipment, portable electric power generators, portable testing equipment and temporary production facilities. Diesel emissions also occur from equipment used during well stimulation treatments, and materials handling causes emissions of PM10 and PM2.5. The steam generators used during enhanced oil recovery are also an important source of emissions from fuel combustion.

Vented gases and fugitive leaks that occur during all phases of well development and production are sources of ROG/VOC and methane, although these can often be detected and cost-effectively reduced, captured, recovered, or controlled by flaring.

In addition, PM10 is released during the drill pad construction phase and from the daily ingress and egress of vehicles on unpaved access roads. The primary emission sources during any new construction at the drill sites and on Rights of Way would be from heavy equipment exhaust and fugitive dust generation. Other emission sources occur during the operation and maintenance of the leases and Rights of Way. Other sources related to oil and gas production include oil facilities, gas facilities, operator vehicle traffic, and diesel or gas-powered oil well pumping units.

Adverse health impacts would be correlated to any potential increases in the ambient concentrations of criteria air pollutants and hazardous air pollutants caused by equipment and sources typical of oil and gas development. Ozone 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 (PM10 and PM2.5) contribute to: reduced lung function; aggravation of respiratory and cardiovascular diseases; increases in mortality rate; reduced lung function growth in children. Dust emissions could also exacerbate the potential exposure of people to Valley Fever.

Oil and gas development under the RFD Scenario 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. Methane 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 so would not be likely to negatively affect a substantial number of people, depending on concentration, wind direction, and proximity to residential area or public facility.

Estimated Air Pollutant Emissions for RFD Scenario

Each alternative includes the 2015 RFD Scenario (i.e., between zero and 37, zero and 32 for Alternative B, development wells with approximately 206 acres, 179 acres for Alternative B, of surface disturbance over the next 15 to 20 years on Federal mineral estate in the Planning Area). For informational purposes, reasonable emissions estimates for any year within the life of this plan are based on three wells per year being constructed and three wells undergoing well stimulation treatments on Federal mineral estate in the CCFO Planning Area. In the last 20 years, two Applications for Permit to Drill on existing BLM leases in the CCFO Planning Area have been submitted and then withdrawn. While construction of three wells per year would be higher than this trend, the two Applications for Permit to Drill were submitted in the two years prior to 2015, and depending on economic conditions, a greater or fewer number of applications could be submitted any year. After the construction activities and emissions are completed, the new wells would transition into long-term operations and maintenance, when the oil and gas production activities and emissions would commence and then continue. The production-phase emissions assume all wells transition to long-term operations and maintenance.

Table 4.5-1 quantifies the maximum anticipated levels of criteria air pollutant emissions during the years of wells being constructed on Federal mineral estate in the CCFO Planning Area, and Table 4.5-2 quantifies the emissions from long-term operations and/or maintenance activities upon full buildout of the RFD Scenario. (Note, because Alternative B would develop up to 32 wells, the emissions for Alternative B would be less than shown in Table 4.5-1 and 4.5-2). These emissions would most likely be in the jurisdiction of either the MBUAPCD or SJVAPCD, depending on the location of the leases.

Table 4.5-1. Development Phase Planning Area Emissions for 2015 RFD Scenario (tons per year)

Development Activity (new well construction and well stimulation of 3 wells per year)	ROG	NOx	CO	SOx	PM10	PM2.5
Surface disturbance	—	—	—	—	27.2	4.1
New well development	0.09	1.46	0.42	0.00	0.05	0.05
Geophysical exploration	0.01	0.25	0.11	0.00	0.01	0.01
Well stimulation	0.15	3.10	0.49	0.00	0.09	0.09
Total (Development)	**0.25**	**4.81**	**1.01**	**0.01**	**27.34**	**4.22**
San Joaquin Valley Air Basin *de minimis* Threshold	**10**	**10**	**100**	**100**	**100**	**100**

Note: RFD Scenario emissions would most likely be in the jurisdiction of either the MBUAPCD or SJVAPCD, depending on the location of the leases. No *de minimis* thresholds apply within the North Central Coast air basin and MBUAPCD.

Table 4.5-2. Production Phase Planning Area Emissions for 2015 RFD Scenario (tons per year)

Operations and Maintenance Activity (long-term, upon buildout of 37 wells in RFD Scenario)	ROG	NOx	CO	SOx	PM10	PM2.5
Oil and gas production, combustion sources	0.13	3.59	0.21	1.04	1.77	1.77
Oil and gas production, vents and fugitives	9.23	—	—	—	—	—
Total (Production)	**9.37**	**3.59**	**0.21**	**1.04**	**1.77**	**1.77**
Total (Development and Production)	**9.62**	**8.40**	**1.22**	**1.04**	**29.11**	**5.99**
San Joaquin Valley Air Basin *de minimis* Threshold	**10**	**10**	**100**	**100**	**100**	**100**

Note: RFD Scenario emissions would most likely be in the jurisdiction of either the MBUAPCD or SJVAPCD, depending on the location of the leases. No *de minimis* thresholds apply within the North Central Coast air basin and MBUAPCD.

The air pollutant emissions would be expected to occur at levels that are below *de minimis* thresholds for pollutants in nonattainment or maintenance areas and below levels that would contribute substantially to an existing or projected air quality violation. The emissions would be predominantly due to sources near well pads and along roadways accessing well sites on new Federal oil and gas leases with few, if any, scattered rural residences nearby. The sources would be focused to within 206 acres of surface in the RFD Scenario in all alternatives. Accordingly, the potential to contribute to an existing or projected air quality violation would be expected to be minor and localized, depending on the area open to leasing in each alternative. Long-term air quality impacts resulting from emissions of operations and/or maintenance activities upon full buildout of the RFD Scenario would be minor.

BLM requires that the lessee/operator ensure that all operations are properly permitted with the local air districts, and that the operations are in compliance with all mobile and stationary source guidelines. Required control measures include such items as dust control using application of water or pre-soaking and limiting traffic speed on unpaved roads. They also include measures such as use of low-emission construction equipment, and/or use of the existing electric distribution facilities, where available, rather than temporary power generators.

State and/or local air quality regulations applicable to the oil and gas development activities would reduce impacts through permit conditions or other restrictions on activities that control emissions to within levels acceptable to the local administering APCD. Examples of the restrictions include complying with rules and regulations for reducing, capturing, and/or controlling vapors, leaks, fugitives, and other emissions listed in this report in Section 3.5.2.

Following the interagency review and analysis included with the Final Air Quality Technical Support Document (see Appendix K), the BLM concludes that ambient air quality air dispersion modeling is not required for this planning effort (BLM, 2019).

New Source Review and Prevention of Significant Deterioration

The Federal CAA requires NSR facility permitting for construction or modification of specified stationary sources for sources of designated nonattainment pollutants, and the Prevention of Significant Deterioration (PSD) program applies to new or modified major stationary sources of pollutants that occur in areas likely to attain the NAAQS. No major stationary sources of air pollution would be likely to occur as a result of the RMPA or under the 2015 RFD Scenario. While no actions or projects related to oil and gas leasing and development are anticipated to require a PSD permit as major stationary sources, minor sources can be expected to trigger the district-level New Source Review permitting process within either the MBUAPCD or SJVAPCD. Additional information on how each local APCD implements the permitting process can be found in the Final Air Quality Technical Support Document (BLM, 2019).

The types of facilities that would qualify as a stationary source and require an air permit from the local air permitting authority include: oil production and process equipment; oil/water separators; organic liquid storage tanks; waste gas flares; stationary engines and combustion turbines; and steam generators and boilers. Proposed BLM authorized actions that would result in substantial air pollutant emissions would be reviewed for potential PSD and NSR requirements and would need to secure all relevant air quality permits before operating.

Federal Class I Areas

The existing and active oil and gas fields within the Monterey County, San Benito County, and Fresno County portions of the CCFO Planning Area are within 100 kilometers of the Pinnacles National Park Class I Area. In the 2015 RFD Scenario, the development-phase sources, construction-type activities, and long-term operations and maintenance would not require use of any major stationary sources that could permanently affect regional air quality or long-range visibility. Therefore, air quality impacts to mandatory

Federal Class I Areas, including deposition of pollutants to soil and water, visibility, and other air quality related values (AQRVs) would be expected to be minor, and air dispersion modeling is not required for this planning effort (BLM, 2019).

The BLM, as a Federal land manager, has an "affirmative responsibility to protect the air quality and related values (including visibility)" of any Federal Class I Area, and to consider whether a proposed major emitting facility will have an adverse impact on those values. The BLM has a responsibility to consider potential air quality impacts on the public lands through the New Source Review permitting process, especially within mandatory Federal Class I Areas. Any project that is anticipated to result in emissions that constitute a "major source" would be reviewed for potential impacts to sensitive receptors, including mandatory Class I Areas. This would be completed at the site-specific NEPA stage.

General Conformity

As described in Section 3.5.2, a general conformity determination is required for any Federal action within any Federal nonattainment and/or maintenance area. BLM authorized actions in the CCFO Planning Area would trigger this requirement if calendar year emissions are anticipated to exceed 10 tons per year of VOC or NOx within the San Joaquin Valley air basin or exceed 100 tons per year of these pollutants in the San Francisco Bay Area air basin, or 100 tons per year of PM10 or PM2.5 in either air basin. No general conformity *de minimis* thresholds apply within the North Central Coast air basin.

The Clean Air Act and its implementing rules (40 CFR 93, Subpart B) state that Federal agencies must make a determination that proposed actions in Federal non-attainment and maintenance areas conform to the applicable implementation plan before the action is taken. In addition, the action cannot cause or contribute to any new violation of the NAAQS, cannot increase the frequency or severity of any existing violation of any NAAQS, or delay timely attainment of any standard or any required interim emission reduction or other milestones.

The BLM has developed a ten-step process to comply with the Federal conformity requirements. These ten steps are: (1) Determine spatial and jurisdiction applicability; (2) Describe SIP status and content; (3) Develop any necessary background information; (4) Develop air quality impact analysis; (5) Compare activity to applicable SIP provisions and rules; (6) Develop conclusion statement; (7) Prepare a formal determination; (8) Conduct an agency/public review; (9) Submit the determination to appropriate regulatory agencies; and (10) Archive the results. Steps 1-6 have been completed as part of this EIS. In accordance with (40 CFR 93.153 (b)(1&2)). Steps 7-10 of this process will not be completed for the RMPA because the total direct and indirect emissions from plan alternatives are likely to be less than *de minimis* levels (see Table 4.5-1 and Table 4.5-2).

4.5.3 Impacts of Alternative A (No Action)

Alternative A would utilize the 2015 RFD Scenario, but would continue current management of air quality as set forth under the existing 2007 HFO RMP (BLM, 2007).

Alternative A would continue the current management goals, objectives, and direction as specified in the 2007 HFO RMP. Alternative A has approximately 683,800 acres currently open to oil and gas leasing and development. Activities and existing trends causing air quality impacts under the management actions for Energy and Minerals in Alternative A would continue as in the current conditions (Section 3.5.4). Stipulations would require oil and gas development activities to comply with applicable air quality regulations. This would be consistent with the management goals for Air Quality and Atmospheric Conditions from the 2007 HFO RMP.

Oil and gas development in Alternative A would result in the types of air pollution sources and estimated levels of emissions that are described in Section 4.5.2, Impacts Common to All Alternatives. Emissions under Alternative A would be at the same levels as shown for the 2015 RFD Scenario in Table 4.5-1 and

Table 4.5-2. The potential to contribute to an existing or projected air quality violation would be minor and localized, and the long-term air quality impacts resulting from emissions upon full buildout of the RFD Scenario would be minor.

Alternative A could result in emissions being located near a sensitive receptor because it would have most Federal mineral estate open to oil and gas leasing, with only certain areas currently closed under the 2007 HFO RMP (Section 2.6.1). This alternative would close fewer acres than other alternatives. Some of the areas open to oil and gas leasing would be near sensitive receptors. As such, Alternative A would have the greatest potential among the alternatives for causing a localized air quality impact to sensitive receptors.

Sensitive receptors would be affected by increased concentrations of air pollutants including hazardous air pollutants from construction activities and oil and gas production, depending on the proximity of the sensitive use. Existing surface uses that could occur near and be incompatible with oil and gas development include urban areas or population centers. Sensitive receptors include, but are not limited to, hospitals, schools, daycare facilities, elderly and convalescent facilities. Occupants of these existing uses or facilities are generally more susceptible to adverse effects of air pollution. Under Alternative A (No Action), these existing uses or facilities could experience unavoidable adverse impacts if oil and gas development is concentrated in one area and allowed to substantially increase air pollutant concentrations near existing sensitive receptors.

Mitigation Measures AQ-1 through AQ-3 (see Appendix C) include the types of measures that could be implemented to lessen the degree of potential adverse air quality impacts from development of oil and gas leases under Alternative A. During review of whether to accept or deny project proposals, BLM managers can decide to attach additional stipulations or measures, such as the following, to minimize or avoid air quality impacts.

Leases Subject to Settlement Agreement – Subalternative 1

The 14 non-NSO leases as identified in Hollister I and Hollister II would be issued. Oil and gas leasing and development within any of the leases subject to the settlement agreement would create emissions within the North Central Coast air basin and in the jurisdiction of the MBUAPCD. Air quality impacts and mitigation would occur within the North Central Coast air basin as described for Alternative A in general.

As described in Section 3.5.4, the leases in Monterey and San Benito Counties would be at least 20 kilometers from Ventana Wilderness Class I Area and Pinnacles National Park. Therefore, air quality impacts to Federal Class I Areas, including deposition of pollutants to soil and water, visibility, and other AQRVs would be expected to be minor. However, any project that is anticipated to result in emissions that constitute a "major source" would be reviewed for potential impacts to sensitive receptors, including mandatory Class I Areas. This would be completed at the site-specific NEPA stage.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impact would occur.

4.5.4 Impacts of Alternative B

Alternative B would close all areas outside of oil and gas fields plus a buffer, which would result in about 39,000 acres open to oil and gas leasing and development. In contrast with the 2015 RFD Scenario, Alternative B would not have 5 exploratory wells, and ground disturbance would be 179 acres because development is limited to the existing oil and gas fields, plus buffer.

The available lands would be subject to stipulations that would require oil and gas development activities to comply with applicable air quality regulations and to minimize or eliminate conflict between oil and gas

development and existing surface uses. This would be consistent with the management goals for Air Quality and Atmospheric Conditions from the 2007 HFO RMP.

Oil and gas development in Alternative B would result in the types of air pollution sources and estimated levels of emissions that are described in Section 4.5.2, Impacts Common to All Alternatives. Emissions under Alternative B would be less than the levels as shown for the 2015 RFD Scenario in Table 4.5-1 and Table 4.5-2 because they would result in fewer wells. The potential to contribute to an existing or projected air quality violation would be minor and localized, and the long-term air quality impacts resulting from emissions upon full buildout of the RFD Scenario would be minor.

This alternative would close more acres than other alternatives. As such, Alternative B would have the least potential among the alternatives for causing a localized air quality impact to sensitive receptors.

The CSU Existing Surface Use/Management stipulation would be applied to areas where the BLM authorized officer determines that pre-existing surface management uses/conditions would be incompatible with or preclude oil and gas operations. This CSU stipulation ensures that proposed activity would be reviewed cooperatively with the surface manager to determine if it is compatible with the existing uses/ conditions, and if not, the activity would be moved or possibly even denied/rejected. This would minimize or eliminate the potential for emissions from oil and gas development to cause substantial air pollutant concentrations and a potentially adverse impact to existing sensitive receptors.

The air quality impacts under the management actions for Energy and Minerals in Alternative B would be generally confined by requiring sources to be within existing oil and gas fields plus a buffer. By confining oil and gas leasing to the existing fields plus the buffer, Alternative B would be likely to avoid exposing sensitive receptors to substantial pollutant concentrations.

Mitigation Measures AQ-1 through AQ-3 in Appendix C include the types of measures that could be implemented to lessen the degree of potential adverse air quality impacts from oil and gas leases and development associated with Alternative B.

Leases Subject to Settlement Agreement

Under Alternative B, the majority of BLM-managed mineral estate that contain the 14 non-NSO leases would be closed to leasing. If new wells were drilled in the open areas over the next 15 to 20 years, oil and gas leasing and development within the leases subject to the settlement agreement would create emissions within the North Central Coast air basin and in the jurisdiction of the MBUAPCD. Air quality impacts and mitigation would occur within the North Central Coast air basin as described for Alternative B in general.

As described in Section 3.5.4, the leases in Monterey and San Benito Counties would be at least 20 kilometers from Ventana Wilderness Class I Area and Pinnacles National Park. Therefore, air quality impacts to Federal Class I Areas, including deposition of pollutants to soil and water, visibility, and other AQRVs would be expected to be minor. However, any project that is anticipated to result in emissions that constitute a "major source" would be reviewed for potential impacts to sensitive receptors, including mandatory Class I Areas. This would be completed at the site-specific NEPA stage.

4.5.5 Impacts of Alternative C

Alternative C would open areas within high oil and gas potential areas or within the boundaries of oil and gas fields, plus a buffer, with the exception of core population areas of the giant kangaroo rat in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills, which would be closed to leasing. Alternative C would close areas that do not have high oil and gas occurrence potential.

The available lands would be subject to stipulations that would require oil and gas development activities to comply with applicable air quality regulations and to minimize or eliminate conflict between oil and gas

development and existing surface uses. This would be consistent with the management goals for Air Quality and Atmospheric Conditions from the 2007 HFO RMP.

Oil and gas development in Alternative C would result in the types of air pollution sources and estimated levels of emissions that are described in Section 4.5.2, Impacts Common to All Alternatives. Emissions under Alternative C would be at the same levels as shown for the 2015 RFD Scenario in Table 4.5-1 and Table 4.5-2. The potential to contribute to an existing or projected air quality violation would be minor and localized, and the long-term air quality impacts resulting from emissions upon full buildout of the RFD Scenario would be minor.

Alternative C would have a potential to result in emissions being located near a sensitive receptor. However, the CSU Existing Surface Use/Management stipulation would be applied to available areas to ensure that proposed activity would be reviewed cooperatively with the surface manager to determine if it is compatible with the existing uses/conditions, and if not, the activity would be moved or possibly even denied/rejected. This would minimize or eliminate the potential for emissions from oil and gas development to cause substantial air pollutant concentrations and a potentially adverse impact to existing sensitive receptors.

Mitigation Measures AQ-1 through AQ-3 in Appendix C include the types of measures that could be implemented to lessen the degree of potential adverse air quality impacts from oil and gas leases and development associated with Alternative C.

Leases Subject to Settlement Agreement

Oil and gas leasing and development within the leases subject to the settlement agreement would create emissions within the North Central Coast air basin and in the jurisdiction of the MBUAPCD. Air quality impacts and mitigation would occur within the North Central Coast air basin as described for Alternative C in general.

As described in Section 3.5.4, the leases in Monterey and San Benito Counties would be at least 20 kilometers from Ventana Wilderness Class I Area and Pinnacles National Park. Therefore, air quality impacts to Federal Class I Areas, including deposition of pollutants to soil and water, visibility, and other AQRVs would be expected to be minor. However, any project that is anticipated to result in emissions that constitute a "major source" would be reviewed for potential impacts to sensitive receptors, including mandatory Class I Areas. This would be completed at the site-specific NEPA stage.

4.5.6 Impacts of Alternative D

Alternative D would open areas of Federal mineral estate underlying BLM surface estate. Alternative D would close all BLM split estate lands and the Ciervo-Panoche Natural Area.

The available lands would be subject to stipulations that would require oil and gas development activities to comply with applicable air quality regulations and to minimize or eliminate conflict between oil and gas development and existing surface uses. This would be consistent with the management goals for Air Quality and Atmospheric Conditions from the 2007 HFO RMP.

Oil and gas development in Alternative D would result in the types of air pollution sources and estimated levels of emissions that are described in Section 4.5.2, Impacts Common to All Alternatives. Emissions under Alternative D would be at the same levels as shown for the 2015 RFD Scenario in Table 4.5-1 and Table 4.5-2. The potential to contribute to an existing or projected air quality violation would be minor and localized, and the long-term air quality impacts resulting from emissions upon full buildout of the RFD Scenario would be minor.

Alternative D would have a limited potential to result in emissions being located near a sensitive receptor. The CSU Existing Surface Use/Management stipulation would be applied to available areas to ensure that proposed activity would be reviewed to determine if it is compatible with the existing uses/conditions. This would minimize or eliminate the potential for emissions from oil and gas development to cause substantial air pollutant concentrations and a potentially adverse impact to existing sensitive receptors.

The air quality impacts under the management actions for Energy and Minerals in Alternative D would be generally confined by requiring sources to be within BLM surface estate. By confining oil and gas leasing to the BLM surface estate, Alternative D would be likely to avoid exposing sensitive receptors to substantial pollutant concentrations.

Mitigation Measures AQ-1 through AQ-3 in Appendix C include the types of measures that could be implemented to lessen the degree of potential adverse air quality impacts from oil and gas leases and development associated with Alternative D.

Leases Subject to Settlement Agreement

Under Alternative D, the majority of BLM-managed mineral estate that contain the 14 non-NSO leases would be closed to leasing. If new wells were drilled in the open areas over the next 15 to 20 years, oil and gas leasing and development within the leases subject to the settlement agreement would create emissions within the North Central Coast air basin and in the jurisdiction of the MBUAPCD. Air quality impacts and mitigation would occur within the North Central Coast air basin as described for Alternative D in general.

As described in Section 3.5.4, the leases in Monterey and San Benito Counties would be at least 20 kilometers from Ventana Wilderness Class I Area and Pinnacles National Park. Therefore, air quality impacts to Federal Class I Areas, including deposition of pollutants to soil and water, visibility, and other AQRVs would be expected to be minor. However, any project that is anticipated to result in emissions that constitute a "major source" would be reviewed for potential impacts to sensitive receptors, including mandatory Class I Areas. This would be completed at the site-specific NEPA stage.

4.5.7 Impacts of Alternative E

Alternative E would open areas of Federal mineral estate outside of a California DWR Bulletin 118 Groundwater Basin and Sub-basin.

The available lands would be subject to stipulations that would require oil and gas development activities to comply with applicable air quality regulations and to minimize or eliminate conflict between oil and gas development and existing surface uses. This would be consistent with the management goals for Air Quality and Atmospheric Conditions from the 2007 HFO RMP.

Oil and gas development in Alternative E would result in the types of air pollution sources and estimated levels of emissions that are described in Section 4.5.2, Impacts Common to All Alternatives. Emissions under Alternative E would be at the same levels as shown for the 2015 RFD Scenario in Table 4.5-1 and Table 4.5-2. The potential to contribute to an existing or projected air quality violation would be minor and localized, and the long-term air quality impacts resulting from emissions upon full buildout of the RFD Scenario would be minor.

Alternative E would have a potential to result in emissions being located near a sensitive receptor. However, the CSU Existing Surface Use/Management stipulation would be applied to available areas to ensure that proposed activity would be reviewed cooperatively with the surface manager to determine if it is compatible with the existing uses/conditions, and if not, the activity would be moved or possibly even denied/rejected. This would minimize or eliminate the potential for emissions from oil and gas development to cause substantial air pollutant concentrations and a potentially adverse impact to existing sensitive receptors.

Mitigation Measures AQ-1 through AQ-3 in Appendix C include the types of measures that could be implemented to lessen the degree of potential adverse air quality impacts from oil and gas leases and development associated with Alternative E.

Leases Subject to Settlement Agreement

Oil and gas leasing and development within the leases subject to the settlement agreement would create emissions within the North Central Coast air basin and in the jurisdiction of the MBUAPCD. Under Alternative E, 10,000 acres of Federal mineral estate that contain the 14 non-NSO leases would be open to leasing, with 400 acres closed and 7,200 acres open with NSO stipulations. If new wells are drilled in the open areas over the next 15 to 20 years, air quality impacts and mitigation would occur within the North Central Coast air basin as described for Alternative E in general.

As described in Section 3.5.4, the leases in Monterey and San Benito Counties would be at least 20 kilometers from Ventana Wilderness Class I Area and Pinnacles National Park. Therefore, air quality impacts to Federal Class I Areas, including deposition of pollutants to soil and water, visibility, and other AQRVs would be expected to be minor. However, any project that is anticipated to result in emissions that constitute a "major source" would be reviewed for potential impacts to sensitive receptors, including mandatory Class I Areas. This would be completed at the site-specific NEPA stage.

4.5.8 Impacts of Alternative F

Under Alternative F, Federal mineral estate would be open to leasing unless currently closed. CSU stipulations would apply to all lands open to leasing (see Appendix C), and NSO stipulations would apply to some lands, for example those including core population areas of the giant kangaroo rat.

The available lands would be subject to stipulations that would require oil and gas development activities to comply with applicable air quality regulations and to minimize or eliminate conflict between oil and gas development and existing surface uses. This would be consistent with the management goals for Air Quality and Atmospheric Conditions from the 2007 HFO RMP.

Oil and gas development in Alternative F would result in the types of air pollution sources and estimated levels of emissions that are described in Section 4.5.2, Impacts Common to All Alternatives. Emissions under Alternative F would be at the same levels as shown for the 2015 RFD Scenario in Table 4.5-1 and Table 4.5-2. The potential to contribute to an existing or projected air quality violation would be minor and localized, and the long-term air quality impacts resulting from emissions upon full buildout of the RFD Scenario would be minor.

Alternative F would have a potential to result in emissions being located near a sensitive receptor because it would have acreage of Federal mineral estate open to oil and gas leasing similar to Alternative A. However, the CSU Existing Surface Use/Management stipulation would be applied to available areas to ensure that proposed activity would be reviewed cooperatively with the surface manager to determine if it is compatible with the existing uses/conditions, and if not, the activity would be moved or possibly even denied/rejected. This would minimize or eliminate the potential for emissions from oil and gas development to cause substantial air pollutant concentrations and a potentially adverse impact to existing sensitive receptors.

Mitigation Measures AQ-1 through AQ-3 in Appendix C include the types of measures that could be implemented to lessen the degree of potential adverse air quality impacts from oil and gas leases and development associated with Alternative F.

Leases Subject to Settlement Agreement

Oil and gas leasing and development within the leases subject to the settlement agreement would create emissions within the North Central Coast air basin and in the jurisdiction of the MBUAPCD. Air quality impacts and mitigation would occur within the North Central Coast air basin as described for Alternative F in general.

As described in Section 3.5.4, the leases in Monterey and San Benito Counties would be at least 20 kilometers from Ventana Wilderness Class I Area and Pinnacles National Park. Therefore, air quality impacts to Federal Class I Areas, including deposition of pollutants to soil and water, visibility, and other AQRVs would be expected to be minor. However, any project that is anticipated to result in emissions that constitute a "major source" would be reviewed for potential impacts to sensitive receptors, including mandatory Class I Areas. This would be completed at the site-specific NEPA stage.

4.6 Climate Change/Greenhouse Gas Emissions

This section addresses impacts to GHG emissions (a proxy for impacts to climate change) from activities allowed under the RMPA alternatives. The primary GHG impacts that can be reasonably expected to occur are emissions from the combustion of fossil fuels and from releases of CO_2 and methane due to oil and gas development and production.

4.6.1 Introduction

Approach to Impact Assessment

The RMPA alternatives would allow oil and gas development in some areas of the BLM Central Coast Field Office (CCFO) Planning Area. Oil and gas development involves extracting materials from the earth using various methods, and these are described in the Reasonably Foreseeable Development (RFD) Scenario (see Appendix B).

Extraction of petroleum resources generally requires preparing the site, drilling, installing well equipment, and storing or transporting the resource off-site. These processes directly produce GHG in engine exhaust emissions and cause CO_2 and methane to be released as a result of treatment or processing of the extracted oil and gas or the byproducts of oil and gas extraction.

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, and air permits may include provisions for controlling GHG emissions, namely methane, as part of a program to reduce leaks or vents of organic compounds.

BLM Best Management Practices/Standard Operating Procedures for Air Quality (Appendix D) could reduce emissions of GHG during oil and gas production by implementing techniques to control vapors, leaks, fugitives, and other emissions that contain CO_2 and methane.

Types of Impacts

BLM is unable to quantify impacts to Climate Change/Greenhouse Gas Emissions from the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.6. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects to Climate Change/Greenhouse Gas Emissions from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground. Other incomplete or unavailable information includes the type(s) of development(s) and site-specific resource conditions because it's impossible for BLM to know how, where, or when leases would be developed.

For example, BLM is unable to quantify GHG emissions from the range of alternatives because the timing, intensity, and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is based on the RFD Scenario, current resource conditions described in Section 3.6, and theoretical approaches or research methods discussed in the Air Quality Technical Support Document (Appendix K).

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of federal minerals in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99 percent) of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. The CCST report also indicates the majority of oil and gas activity in the planning area entails conventional well drilling. The CCST report suggests the potential for future operations to include enhanced well stimulation techniques is low because previous attempts to extract resources using hydraulic fracturing have not been productive or economical. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects of future leasing and development on resources in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

Assumptions

All activities must comply with applicable laws and regulations and may be subject to review for certain types of GHG emissions by the local air permitting authority. The potential GHG emissions from oil and gas development would occur in the following context:

- The oil and gas produced by the development described in the RFD Scenario would be delivered into California's existing energy supply system, which would not need to be modified to accommodate the incremental production. California is implementing and will continue to implement numerous State laws, policies, and programs specifically designed to reduce the demand and need for conventional energy from oil and gas resources.
- The California Air Resources Board (ARB) requires any operator of GHG sources in the Petroleum and Natural Gas Systems source category to quantify and report CO_2, CH_4, and N_2O emissions, when stationary combustion and process emissions equal or exceed 10,000 metric tons CO_2e or their stationary combustion, process, fugitive, and vented emissions equal or exceed 25,000 metric tons of CO_2e, from seventeen source types on a well-pad or associated with a well-pad (17 CCR 95152(c)).
- Operators of GHG sources in the category of Petroleum and Natural Gas Systems became covered by the Cap-and-Trade Program on January 1, 2013 (17 CCR 95852.2(b)), along with other large industrial facilities, electric generating utilities, and electricity importers.
- Entities operating oil and gas production, processing, storage and transmission compressor stations are required by the ARB through regulations approved in April 2017 (17 CCR 95665-95677) to reduce CH_4 emissions; however, the effects of these controls are not reflected in the quantification of directly emitted GHG.
- The GHG emissions from end-use of oil and gas produced by leasing and development activity in the CCFO Planning Area would be indirect effects of the production because the emissions would occur at a different time and farther removed in distance from the leasing and development activity.

The discussion of cumulative impacts appears in Section 5.3.5. Globally, GHG emissions contribute, by their nature, on a cumulative basis to the adverse environmental impacts of global climate change. Because the primary environmental effect of GHG emissions would be to exacerbate global climate change and the numerous side-effects on the environment and humans, the area of influence for GHG impacts is global. However, those effects of climate change would also be manifested on resources and ecosystems in California, as summarized in the discussions of Climate Change Indicators and Evidence as part of the Current Conditions and Trends, Section 3.6.4.

4.6.2 Impacts Common to All Alternatives

The RFD Scenario (i.e., between zero and 37 development wells with approximately 206 acres of surface disturbance over the next 15 to 20 years on Federal mineral estate in the Planning Area) would occur under all of the alternatives. However, a maximum of 32 development wells is considered for Alternative B because leasing is allowed only within current oil and gas fields plus a 0.5-mile buffer defined by DOGGR, which would not allow for any exploratory wells.

For all alternatives, the most likely areas of development are either in the North Central Coast air basin or in the San Joaquin Valley air basin. Little or no new oil and gas activity is anticipated in the BAAQMD portion of the CCFO Planning Area.

For all alternatives, leases subject to the settlement agreement occur in the North Central Coast air basin and in the jurisdiction of the MBUAPCD, and there are no leases subject to the settlement agreement located in the San Joaquin Valley air basin or the San Francisco Bay Area air basin.

GHG Sources Associated with RFD Scenario

Anticipated GHG emissions from oil and gas development include direct emissions of CO_2 due to fuel combustion by all equipment and vehicles, including drill rig engines, drill pad construction equipment, temporary production flaring, remedial well work, equipment trucks, hauling of liquids, drill rig crew trucks/vehicles, portable lift equipment, portable testing equipment and temporary production facilities. Combustion emissions also occur from equipment used during well stimulation treatments and from boilers or steam generators used during enhanced oil recovery (EOR).

Vented gases and fugitive leaks that occur during all phases of well development and production are sources of volatile organic compounds (VOC) and reactive organic gases (ROG), which are regulated as air pollutants (Section 3.5 and Section 4.5), and methane, although these can often be detected and cost-effectively reduced, captured, recovered, or controlled by flaring.

Estimated GHG Emissions for 2015 RFD Scenario

Each alternative includes the 2015 RFD Scenario (i.e., up to 37 wells and 206 acres of surface disturbance for all Alternatives except Alternative B and up to 32 wells and 170 acres of surface disturbance for Alternative B). For informational purposes, reasonable emissions estimates for any year within the life of this plan were calculated and are based on three wells per year being constructed and three wells undergoing well stimulation treatments on Federal mineral estate in the CCFO Planning Area. After the construction activities and emissions are completed, the new wells would transition into long-term operations and maintenance, when the oil and gas production activities and emissions would commence and then continue. The production-phase emissions assume all 37 wells transition to long-term operations and maintenance.

Table 4.6-1 quantifies the anticipated levels of GHG emissions during the years of wells being developed on Federal mineral estate, and Table 4.6-2 quantifies the GHG emissions from long-term operation and/or maintenance activities upon full buildout of the RFD Scenario. (Note, because Alternative B would develop up to 32 wells, the emissions for Alternative B would be less than shown in Table 4.6-1 and 4.6-2). Boilers or steam generators used during EOR would cause the majority of GHG emissions during the production phase. These emissions would most likely be in the jurisdiction of either the MBUAPCD or SJVAPCD, depending on the location of the leases.

Table 4.6-1. Development Phase GHG Emissions for 2015 RFD Scenario (metric tons per year)

Development Activity (new well construction and well stimulation of three wells per year)	CO_2e ($MTCO_2e$ per year)
New Well Development with Surface Disturbance	200.1
Geophysical Exploration	57.3
Well Stimulation	327.0
Total (Development)	**584.4**

Table 4.6-2. Production Phase GHG Emissions for 2015 RFD Scenario (metric tons per year)

Operations and Maintenance Activity (long-term, upon buildout of 37 wells in RFD Scenario)	CO_2e ($MTCO_2e$ per year)
Oil and Gas Production, combustion sources	18,500.0
Oil and Gas Production, vents and fugitives	(included above)
Total (Production)	**18,500**
Total (Development and Production)	**19,084**

The directly emitted GHG due to simultaneous development and production phase activities would occur at levels that are below the 25,000 $MTCO_2e$ annual threshold for mandatory reporting of GHG in the U.S. EPA Mandatory Reporting Program (40 CFR Part 98). If combustion or process emissions for an individual production facility were to exceed 10,000 $MTCO_2e$ per calendar year, then the ARB mandatory reporting requirements would become applicable to that facility. These emissions would occur in the context of about 18 $MMTCO_2e$ of annual GHG emissions due to oil and gas extraction and processing activities before refining or end-use in California statewide (ARB, 2018).

Additional GHG emissions would occur as an indirect effect during transport to refiners and refining, and during the end-use of oil and gas produced by leasing and development activity in the CCFO Planning Area. Nationwide emissions from the extraction and end-use combustion of fossil fuels produced on Federal lands in 2014 were 1,332 $MMTCO_2e$ (Merrill, 2018). A rough estimate of possible indirect CO_2 emissions is provided below based on the RFD Scenario and other publicly available information. For informational purposes, we have summarized these possible indirect emissions by estimating 318,718 barrels of crude oil anticipated to be produced annually based on the historic production capabilities of active wells in existing fields within the CCFO Planning Area. The estimated carbon intensity of crude oil production and transport from all fields in California is published by the ARB's LCFS program; this data for crudes produced from within the CCFO Planning Area indicates that 53,754 $MTCO_2e$ could occur as a result of production plus transport of this volume of crude oil from the fields to refineries. Subtracting the annual production phase GHG emissions (19,084 MT) from the estimate of production plus transport (53,754 MT) allows an estimate for the indirect effect of transport of 34,670 $MTCO_2e$ per year. Using the assumptions outlined below, Table 4.6-3 also quantifies 141,062 metric tons of CO_2 of GHG emissions from the end use of crude oil that could possibly be produced annually by full buildout of the RFD Scenario. Table 4.6-3 shows the resulting sum of production plus transport, with the additional GHG resulting from the eventual combustion or end-use of the crude oil (including CO_2, CH_4, and N_2O), under the RFD Scenario would be 195,285 $MTCO_2e$ per year. This quantity represents about 0.015 percent of the national GHG emissions from the extraction and end-use combustion of fossil fuels produced on Federal lands.

Table 4.6-3. Estimated Indirect End Use GHG Emissions for 2015 RFD Scenario

Indirect GHG Emissions (Reference)	CO_2 Emission Factor	Resulting Estimate of End Use Emissions	CO_2e ($MTCO_2e$ per year)
Production plus Transport (ARB LCFS)	26.67 g CO_2e/MJ	—	**53,754**
Indirect End Use (IPCC)	73,300 kg/TJ	325,723,502 CO_2 lb/yr	147,747
Indirect End Use (EIA, 2011)	10.29 kg/gallon	303,669,069 CO_2 lb/yr	137,743
Indirect End Use (EPA, 2016)	74.54 kg/MMBtu	303,566,371 CO_2 lb/yr	137,697
Estimated Indirect End Use CO_2 Emissions	(Average of above)	**310,986,314 CO_2 lb/yr**	**141,062**
Estimated Indirect End Use GHG Emissions (CO_2e)	Include CH_4 and N_2O (EPA,2016)	—	**141,531**
Production Phase plus Indirect GHG Emissions Total (CO_2e)		—	**195,285**

Sources:
Air Resources Board (ARB) Calculation of 2012 Crude Average Carbon Intensity (CI) Values.
Intergovernmental Panel on Climate Change (IPCC), 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2, Energy, 2006, Table 2.2 Default Emission Factors for Stationary Combustion in the Energy Industries (kg of greenhouse gas per TJ on a Net Calorific Basis).
U.S. EIA, 2011. Voluntary Reporting of Greenhouse Gases Program. Fuel Emission Coefficients Table 1 (CO2 for Stationary Combustion).
U.S. EPA, 2016. Mandatory Greenhouse Gas Reporting Regulation. 40 CFR Part 98, Subpart C, Table C-1. (Default HHV, CO2 factors).

With respect to the rough estimate of indirect CO_2 emissions, it should be noted that it is difficult to discern with certainty how transport would occur and what end uses for the fuels extracted from a particular lease might be reasonably foreseeable. For instance, some end uses of fossil fuels extracted from Federal leases include: combustion of transportation fuels, fuel oils for heating or industrial use, as well as production of asphalt and road oil, and the feedstocks used to make chemicals, plastics, and synthetic materials. The estimate is based on an approximation of these end uses on a national basis using the references cited. While the BLM based these estimates on state-specific transport and national data about typical end use of produced oil and gas, it is important to note that the BLM does not exercise control over the specific end use of the oil and gas produced from any individual Federal lease.

The GHG emissions from oil and gas development and production, if allowed by leasing, would occur along with indirect emissions from end-users of the fuels. However, these direct and indirect emissions would not be likely to conflict with any applicable plan, policy, or regulations adopted for the purpose of reducing GHG emissions. California's regulatory setting, including reporting of GHG and the Cap-and-Trade Program (Section 3.6.2, Regulatory Framework), provides oversight and management of GHG directly emitted during development and production and indirectly emitted by end users of the petroleum products. The GHG emissions and the associated direct and indirect impacts would be minor.

Oil and gas development activities would not disrupt the Global Warming Solutions Act of 2006 (AB 32) and subsequent programs. State climate change programs and/or local air quality regulations applicable to oil and gas development activities would require reporting and controlling GHG through permit conditions or participation by the operators in mandatory programs for GHG management.

Suppliers of transportation fuels and the end-use of oil and gas as a transportation fuel in California would need to comply with California's Low Carbon Fuel Standard (LCFS). Under this program, transportation fuel suppliers must demonstrate that the mix of fuels they provide meet the carbon intensity standards of the LCFS, where the carbon intensity is a measure of the GHG emissions associated with the various production, distribution, and use steps in the "life-cycle" of the fuel. This ensures that downstream use of oil and gas as a transportation fuel would meet the LCFS. Additionally, fuel suppliers, including refiners,

pipeline companies and railroads, generally bear the compliance obligation in the Cap-and-Trade Program for the GHG from end-use of the petroleum products for fuel users not otherwise covered. This means that the combustion emissions of the fuel delivered to all end-users are covered in the Cap-and-Trade Program.

4.6.3 Impacts of Alternative A (No Action)

Alternative A would utilize the 2015 RFD Scenario while continuing current management under the existing 2007 HFO RMP (BLM, 2007). The 2007 HFO RMP did not define goals, objectives, or management actions for GHG or Climate Change.

Oil and gas leasing and development activities under the management actions for Alternative A would be based on development under the RFD Scenario, and thus, would result in direct and indirect impacts from GHG emissions that would be minor and at the same level as described in Section 4.6.2, Impacts Common to All Alternatives.

The BLM would require Best Management Practices/Standard Operating Procedures for Air Quality (Appendix D). These could reduce emissions of GHG during oil and gas production by implementing techniques to control vapors, leaks, fugitives, and other emissions that contain CO_2 and methane.

Leases Subject to Settlement Agreement – Subalternative 1

The 14 non-NSO leases as identified in Hollister I and Hollister II would be issued. The leases subject to the settlement agreement would result in GHG emissions as described in Section 4.6.2, Impacts Common to All Alternatives, that would occur in the North Central Coast air basin, in the jurisdiction of the MBUAPCD.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impact would occur.

4.6.4 Impacts of Alternative B

Oil and gas development and GHG emissions would occur at less than the maximum levels projected with the 2015 RFD Scenario, because Alternative B would have 5 fewer wells, and ground disturbance would be up to 179 acres. Alternative B would include only areas within the boundaries of oil and gas fields, plus a buffer, so all impacts assumed from the maximum of 5 exploratory wells would not occur.

Oil and gas leasing and development activities under the management actions for Energy and Minerals in Alternative B would result in direct and indirect impacts from GHG emissions that would be minor and at the same level as described in Section 4.6.2, Impacts Common to All Alternatives.

The BLM would require Best Management Practices/Standard Operating Procedures for Air Quality (Appendix D). These could reduce emissions of GHG during oil and gas production by implementing techniques to control vapors, leaks, fugitives, and other emissions that contain CO_2 and methane.

Leases Subject to Settlement Agreement

Under Alternative B, the majority of BLM-managed mineral estate that contain the 14 non-NSO leases would be closed to leasing. If new wells are drilled in the open areas over the next 15 to 20 years, the leases subject to the settlement agreement would result in GHG emissions as described in Section 4.6.2, Impacts Common to All Alternatives, that would occur in the North Central Coast air basin, in the jurisdiction of the MBUAPCD.

4.6.5 Impacts of Alternative C

Oil and gas development and GHG emissions would occur up to the levels projected with the 2015 RFD Scenario. This is because although Alternative C would open only areas within high oil and gas potential areas or within the boundaries of oil and gas fields, plus a buffer, virtually all development projected by the RFD would be expected to occur in these areas.

Oil and gas leasing and development activities under the management actions for Energy and Minerals in Alternative C would result in direct and indirect impacts from GHG emissions that would be minor and at the same level as described in Section 4.6.2, Impacts Common to All Alternatives.

The BLM would require Best Management Practices/Standard Operating Procedures for Air Quality (Appendix D). These could reduce emissions of GHG during oil and gas production by implementing techniques to control vapors, leaks, fugitives, and other emissions that contain CO_2 and methane. No additional mitigation is recommended for Alternative C.

Leases Subject to Settlement Agreement

The leases subject to the settlement agreement would result in GHG emissions as described in Section 4.6.2, Impacts Common to All Alternatives, that would occur in the North Central Coast air basin, in the jurisdiction of the MBUAPCD.

4.6.6 Impacts of Alternative D

Oil and gas development and GHG emissions would occur at the levels projected with the 2015 RFD Scenario, although Alternative D would include only areas of Federal mineral estate underlying BLM surface estate.

Oil and gas leasing and development activities under the management actions for Energy and Minerals in Alternative D would result in direct and indirect impacts from GHG emissions that would be minor and at the same level as described in Section 4.6.2, Impacts Common to All Alternatives.

The BLM would require Best Management Practices/Standard Operating Procedures for Air Quality (Appendix D). These could reduce emissions of GHG during oil and gas production by implementing techniques to control vapors, leaks, fugitives, and other emissions that contain CO_2 and methane.

Leases Subject to Settlement Agreement

Under Alternative D, the majority of BLM-managed mineral estate that contain the 14 non-NSO leases would be closed to leasing. If new wells are drilled in the open areas over the next 15 to 20 years, the leases subject to the settlement agreement would result in GHG emissions as described in Section 4.6.2, Impacts Common to All Alternatives that would occur in the North Central Coast air basin, in the jurisdiction of the MBUAPCD.

4.6.7 Impacts of Alternative E

Oil and gas development and GHG emissions would occur at the levels projected with the 2015 RFD Scenario, although Alternative E would include areas of Federal mineral estate outside of a California DWR Bulletin 118 Groundwater Basin and Sub-basin.

Oil and gas leasing and development activities under the management actions for Energy and Minerals in Alternative E would result in direct and indirect impacts from GHG emissions that would be minor and at the same level as described in Section 4.6.2, Impacts Common to All Alternatives.

The BLM would require Best Management Practices/Standard Operating Procedures for Air Quality (Appendix D). These could reduce emissions of GHG during oil and gas production by implementing techniques to control vapors, leaks, fugitives, and other emissions that contain CO_2 and methane.

Leases Subject to Settlement Agreement

Under Alternative E, 10,000 acres of BLM-managed mineral estate that contain the 14 non-NSO leases would be open to leasing, with 400 acres closed and 7,200 acres open with NSO stipulations. If new wells are drilled in the open areas over the next 15 to 20 years, the leases subject to the settlement agreement would result in GHG emissions as described in Section 4.6.2, Impacts Common to All Alternatives that would occur in the North Central Coast air basin, in the jurisdiction of the MBUAPCD.

4.6.8 Impacts of Alternative F

Oil and gas development and GHG emissions would occur at the levels projected with the 2015 RFD Scenario, and under Alternative F, Federal mineral estate would be open to leasing unless currently closed under the 2007 Hollister Field Office RMP. Federal mineral estate would be open with CSU stipulations and/or NSO stipulations that would apply to some lands, for example those including core population areas of the giant kangaroo rat.

Oil and gas leasing and development activities under the management actions for Energy and Minerals in Alternative F would result in direct and indirect impacts from GHG emissions that would be minor and at the same level as described in Section 4.6.2, Impacts Common to All Alternatives.

The BLM would require Best Management Practices/Standard Operating Procedures for Air Quality (Appendix D). These could reduce emissions of GHG during oil and gas production by implementing techniques to control vapors, leaks, fugitives, and other emissions that contain CO_2 and methane.

Leases Subject to Settlement Agreement

The leases subject to the settlement agreement would result in GHG emissions as described in Section 4.6.2, Impacts Common to All Alternatives that would occur in the North Central Coast air basin, in the jurisdiction of the MBUAPCD.

4.7 Groundwater Resources

4.7.1 Introduction

Approach to Impact Assessment

The impacts analysis evaluates both quantity and quality of groundwater resources with a focus on protected waters, defined as waters containing less than 10,000 mg/L TDS outside of an exempt aquifer. For Alternatives A and C through F, the RFD Scenario assumes that up to 37 new oil and gas wells would be drilled in the CCFO Planning Area. Under the RFD Scenario, 32 wells would be drilled in or adjacent to existing oil and gas fields within the CCFO Planning Area, and up to five exploratory wildcat wells would be drilled outside of existing oil and gas fields. Because Alternative B only includes Federal mineral estate within oil and gas fields, a maximum of 32 wells is assumed for Alternative B; remaining alternatives are assumed to contain the maximum 37 wells. Also assumed in the RFD Scenario is that all wells may be treated with well stimulation techniques (including hydraulic fracturing).

Although the alternatives vary as to which parcels of BLM mineral estate will be open to oil and gas leases, this approach will make a conservative assumption that the total number of wells forecast in the RFD scenario can be drilled on any Federal mineral estate available in the associated alternative. For Alternative B, up to 32 wells can be drilled on any Federal mineral estate within an oil and gas field; for all remaining alternatives, up to 37 wells can be drilled on any Federal mineral estate open under that alternative. Recent oil and gas development has been concentrated in four existing fields: Coalinga and Jacalitos fields in western Fresno County and San Ardo and Lynch Canyon fields in Monterey County. BLM administers Federal mineral estate in all of these fields except the Lynch Canyon field.

The analysis is conducted to ensure that outcomes are consistent with the proposed RMP management goals provided in the 2007 RMP for the CCFO Planning Area (BLM, 2007). For water resources, the RMP goals include (1) maintain, restore, or improve water quality and quantity to sustain the designated beneficial uses on Federal mineral estate and (2) ensure that surface and groundwater quality comply with the Clean Water Act (CWA) and with California State standards. The first goal is consistent with the State's Porter Cologne Act (see Section 3.7.2) and the basin plans developed by the State Water Resources Control Board (SWRCB). Also incorporated into the analysis are the BLM objectives to achieve those goals, along with the area-wide management actions related to groundwater (BLM, 2007). The second goal addresses the State's Anti-degradation Policy. As discussed in Section 1.2.2, oil and gas operators must comply with both Federal and State statutes and regulations to the extent that State regulations are consistent with Federal law and Federal lease rights.

The approach for analyzing impacts on groundwater quantity includes a review of published information of water use for oil and gas drilling and well stimulation. The total amount of water needed for the 2015 RFD Scenario is tabulated and compared to groundwater resources in the CCFO Planning Area. The approach to the impacts analysis for groundwater quality focuses on the pathways by which flowback and/or formation fluids could reach protected groundwater. The chemical composition of well stimulation fluids and associated formation fluids is considered. To meet RMP management goals and to comply with Federal and state water quality standards in California, protected groundwater is assumed to be impacted if well stimulation fluids and associated formation fluids are likely to migrate into the protected groundwater zone via any of the identified pathways.

BLM is unable to quantify impacts to groundwater resources from the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.7. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these

impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects to groundwater resources from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground. Other incomplete or unavailable information includes the type(s) of development(s) and site-specific resource conditions because it's impossible for BLM to know how, where, or when leases would be developed.

For example, BLM is unable to determine the source of water for future oil and gas development under the range of alternatives because the timing, intensity, and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is based on current resource conditions described in Section 3.7, and the regulatory framework for water resources described in Appendix J.

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of federal minerals in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99 percent) of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. The CCST report also indicates the majority of oil and gas activity in the planning area entails conventional well drilling. The CCST report suggests the potential for future operations to include enhanced well stimulation techniques is low because previous attempts to extract resources using hydraulic fracturing have not been productive or economical. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects of future leasing and development on resources in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

Assumptions and Key Studies

- For purposes of the impact analysis for groundwater in this EIS/RMPA, 10,000 mg/L TDS is the water quality threshold for evaluating potential impacts on groundwater resources.
- The impacts analysis is based primarily on the impacts identified in CCST's 2014 report on well stimulation technologies, prepared to provide BLM with information to be used for "future planning, leasing, development decisions regarding oil and gas issues on the Federal mineral estate in California" (CCST, 2014, pg. 17).
- The impact analysis also considers information from recent studies conducted by the EPA (2016) and USGS (Taylor et al., 2014), as well as a recent proposal prepared for the State Water Resources Control Board by USGS (Taylor et al., 2014). In addition to these studies, this analysis incorporates information provided in the Final Environmental Impact Report, Analysis of Oil and Gas Well Stimulation Treatments in California, prepared in compliance with SB 4 (DOC, 2015).
- Data on oil and gas fields in the CCFO Planning Area were derived from unpublished data developed by DOGGR (see Appendix J in DOC, 2015) and DOGGR publications (DOC, 1998).

4.7.2 Impacts Common to All Alternatives

The following is a summary of impacts to groundwater resources that are common to all alternatives.

Groundwater Quantity

CCST indicates that in California, water use for hydraulic fracturing is less than in other states and is a fraction of statewide water use. Nonetheless, water use in California can impact local water supplies, especially during drought conditions (CCST, 2014, pg. 34). Although it is not possible to make specific

determinations at this time as to where or when these kinds of impacts may occur, climate change could also affect water supply, such that water usage for well stimulation would exacerbate the impacts of climate change on groundwater quantity and water supply within the CCFO Planning Area. EPA notes that impacts related to water use are based on local water availability (EPA, 2016). CCST compiled water use data for 1,760 hydraulic fracturing events in California from FracFocus, Central Valley Regional Water Quality Control Board (CVRWQCB), South Coast Air Quality Management District (SCAQMD), and DOGGR's well stimulation disclosures from 2011 through June 2014. During that time period, water use per hydraulic fracturing treatment ranged from a minimum of 4,200 gallons (approximately 0.1 AF) per well to a maximum of 4,860,000 gallons (approximately 14.9 AF) per well, with an average use of 140,000 gallons (approximately 0.4 AF) (CCST, 2015a, pg. 121). CCST estimates that between 125 and 175 wells in California are hydraulically fractured per month (CCST, 2015a, pg. 149). Using the average water use of 140,000 gallons per well, statewide water use for hydraulic fracturing ranges from approximately 640 acre-feet per year (AFY) (assuming 125 wells per month) to approximately 900 AFY (assuming 175 wells per month). As described in Section 3.7.4, only one hydraulic fracturing event compiled by CCST (2015a, Appendix O) was conducted in the CCFO Planning Area. A well in the Guijarral Hills field, in Fresno County, was hydraulically fractured in December 2013 and 2,123,268 gallons of water was used (CCST, 2015a, Appendix O). CCST did not provide the water source, but the field is within portions of the Westside subbasin (5-22.09) and Pleasant Valley subbasin (5-22.10), and therefore it is possible that groundwater from one of these subbasins was used.

Table 4.7-1. Water Use per Well for Drilling and Well Stimulation Treatments

Operations	Estimated Water Use per Well (acre feet)
Conventional well drilling operations[1]	0.39 – 0.77
Conventional well stimulation treatments[2]	0.40
Total Conventional Well Operations	**0.79 – 1.17**
Exploratory well drilling operations[1]	5 – 10
Water-intensive well stimulation treatments[1]	10 – 20
Total Water-Intensive Well Operations	**15 – 30**

1 - SB 4 Final EIR (see Table 10.14-6, DOC, 2015).
2 - CCST, 2015a, pg. 121.

Data provided by CCST are based on records for hydraulic fracturing treatments in California over the last few years. These conventional treatments typically involve a vertical well with only one to three stages of well stimulation treatments. Depending on advances in technology and future determination of favorable geologic conditions, future well stimulation may involve deep and long horizontal wells with up to 20 stages of well stimulation treatments for each well to reach unconventional oil reservoirs. Estimates of water use for these more water-intensive well stimulation treatments were developed for the SB 4 Final EIR (see Table 10.14-6, DOC, 2015). As summarized in the Final EIR, an upper estimate of water use for 20 stages of an exploratory well stimulation treatment may range from approximately 3,258,510 gallons to 6,517,020 gallons per well (10 AF to 20 AF). As described above, the one hydraulic fracturing treatment completed in the CCFO Planning Area within the last few years used approximately 2.1 million gallons of water (CCST, 2015a, Appendix O). Therefore, using these water use estimates for water-intensive well stimulation treatments is appropriate for the CCFO Planning Area.

Water is also used for drilling new wells. Exact amounts of water vary substantially with well design, depth, and location. Water use for drilling a typical oil well in California is approximately 4,200 gallons (approximately 0.1 AF) per day per well (Section 7.3.3, DOC, 2015). Although the number of days needed to drill and complete a well varies considerably, many of the existing fields with BLM mineral estate contain relatively shallow wells (less than 5,000 feet deep). Based on this depth, it is assumed that the drilling and completion process would take no more than 30 days to 60 days, resulting in a conservative estimated water use of 126,000 gallons (0.39 AF) to 252,000 gallons (0.77 AF). This amount may be substantially larger for an exploratory horizontal well; a high-end range for an exploratory well is estimated to be from about 1,600,000 gallons to 3,250,000 gallons (5 AF to 10 AF) (see Table 10.14-6, DOC, 2015).

Based on well stimulation notices filed through the middle of January 2014, CCST indicates that 96 percent (238 of 249) of the planned well stimulation treatments will use fresh water for hydraulic fracturing (CCST, 2014, pg. 186). Fresh water may be obtained from surface water or groundwater. The actual water source(s) (e.g., surface water or groundwater) to be used for drilling and well stimulation in the CCFO Planning Area is unknown and is likely to vary according to location. Consistent with a conservative approach, groundwater is assumed to be used for all drilling and well stimulation activities for the maximum of 37 wells in the 2015 RFD Scenario. Assuming groundwater use for both drilling and well stimulation, the estimated total water use per well for conventional wells (relatively shallow, vertical wells with a few stages of well stimulation) ranges from 0.79 AF to 1.17 AF, as shown in Table 4.7-1. The estimated total water use for water-intensive wells (deep horizontal wells with up to 20 stages of well stimulation) ranges from 15 AF to 30 AF per well.

To provide end members for a range of total water use for the RFD scenario, two assumptions regarding the number of conventional and water-intensive wells were considered. RFD Scenario 1 assumes that all 37 wells will be conventional vertical wells with well stimulation treatments involving one to three stages. For RFD Scenario 2, all 37 wells are assumed to be water-intensive horizontal wells with well stimulation treatments involving up to 20 stages. Using estimates per well on Table 4.7-1, total water use estimates for the two types of well stimulation operations are summarized in Table 4.7-2.

Assuming that all wells use groundwater, 37 conventional well operations would require an estimated 29 AF to 43 AF of groundwater (Table 4.7-2); 37 water-intensive well operations would require an estimated 555 AF to 1,110 AF of groundwater (Table 4.7-2). Water-intensive operations would use between approximately 19 to 26 times more water than conventional well operations. A combination of conventional and water-intensive wells would have a total groundwater use within this range. All of these estimates represent groundwater use over a time period of 15 to 20 years (as assumed in the RFD Scenario). Assuming a 20-year period, total groundwater use would range from 1.5 AFY to 55.5 AFY.

Table 4.7-2. Total Water Use Estimates for the RFD Scenario

RFD Scenario 1	Estimated Water Use per Well (AF)	Number of Wells[3]	Total Estimated Water Use (AF)
Conventional well operations[2]	0.79 – 1.17	37	29.23 – 43.29
Water-Intensive well operations[1]	15 – 30	0	0
Total water use, RFD Scenario 1[3]			29.23 – 43.29
RFD Scenario 2			
Conventional well operations[2]	0.79 – 1.17	0	0
Water-Intensive well operations[1]	15 – 30	37	555 – 1,110
Total water use, RFD Scenario 2[3]			555 – 1,110

1 - SB 4 Final EIR (see Table 10.14-6, DOC, 2015).
2 - CCST, 2015a, pg. 121.
3 - RFD Scenario (Except Alternative B, which has 32 wells; see discussion below).

For Alternative B, the number of wells is reduced slightly from 37 to 32, which also reduces the amount of water use estimated above. Applying a similar methodology as described above to 32 wells results in a total groundwater use ranging from 1.5 AFY to 48 AFY.

Potential impacts of groundwater withdrawals identified by CCST include decreases in river flows, land subsidence, reductions in aquifer storage, and increased pumping costs or the need to deepen or drill new wells (CCST, 2014, pg. 187). Water quantity impacts depend on local conditions, and therefore, require a site-specific analysis (CCST, 2014, pg. 187). Water demand for a well stimulation event occurs over a

short period of time. Therefore, groundwater resources can be stressed if well stimulation occurs during the driest times of the year or if multiple well stimulation jobs are being conducted at the same time in the same geographic area. The volumes of water are often less important than the rates and timing of the withdrawals. An impact analysis of groundwater quantity in the Final EIR for SB 4 noted that many groundwater basins had already been critically impacted according to rankings by CDWR, including basins/subbasins with overdraft conditions. As noted in the Final EIR, any increase in groundwater use in a basin/subbasin in overdraft would contribute to overdraft conditions, a process considered to be a substantial impact if not mitigated.

Although all of these potential impacts are applicable to groundwater resources in the CCFO Planning Area, the details of the RFD Scenario indicate that the maximum amount of groundwater use would be 1,110 AF (361,696,830 gallons) for the 37 wells. Whether any impacts to groundwater quantity could occur would depend on site-specific conditions that cannot be quantified at this time and would be analyzed at the leasing and development stages (see Section 4.7.1 discussing missing or incomplete information). Nonetheless, the potential for groundwater quantity impacts is common to all six alternatives.

Groundwater Quality

CCST identified over 300 chemicals or chemical mixtures used for hydraulic fracturing in California (CCST, 2015b, pg. 70). The chemical additives used in well stimulation activities can include the same or similar type of additives used in water- and steam-flooding enhanced recovery operations which are applied in volumes higher than in well stimulation (Taylor et al., 2014). The environmental toxicity of approximately two-thirds of these chemicals is unknown because of a lack of publicly available information (CCST, 2015b, pg. 162). Thirty-three of the chemicals were found to be hazardous to aquatic species and could pose a threat to the environment if released (CCST, 2015b, pg. 162). Many of the chemicals are equivalent to the toxicity of household products, which is not insignificant, and numerous chemicals are non-toxic (CCST, 2014, pg. 194). However, CCST is clear that a more complete assessment of the hazards associated with well stimulation fluids in California is necessary (CCST, 2014, pg. 193; CCST, 2015b, pages 153-166). CCST notes that their analysis is limited and full disclosure of the chemicals used during hydraulic fracturing is required in order to understand the potential environmental quality impacts (CCST, 2014, pg. 194; CCST, 2015b, pg. 162).

CCST also compared chemicals associated with well stimulation fluids used in California with those used in other parts of the country and concluded that the composition of fluids used in California were significantly different. This difference was attributed to the prevalence of gel-based fluids in California that require smaller amounts of water but also contain higher concentrations of chemicals. Given that most of the hydraulic fracturing in California occurs in relatively shallow wells, this often results in fluids with concentrated chemicals being used in close vertical proximity (less than 2,000 feet) to protected groundwater (CCST, 2014, pages 219-220).

CCST notes that the chemical constituents of produced water from stimulated wells in California has not been studied (CCST, 2015b, pg. 163). However, starting in July 2015, operators are required to sample produced water initially following well stimulation and then again after 30 days of production (CCST, 2015b, pg. 91) Therefore, produced water quality from stimulated wells will be better understood in the future.

It is understood that produced water reflects the water quality of the formation (CCST, 2015b, pg. 97). Oil and gas formations can contain methane, salts, trace metals, naturally occurring radioactive materials (NORM), and organic materials that can return to the surface with flowback and produced waters. TDS concentrations of flowback and produced water in California from well stimulation operations may be lower than in other regions because well depths are shallower than in other parts of the United States (CCST, 2014, pg. 205). Trace metals concentrations in the Monterey Formation are high, and therefore flowback

and produced waters in California are expected to have higher than average trace metal concentrations (CCST, 2014, pg. 205). CCST notes that there is a lack of data on NORM content in flowback and produced water in California and regards this as a major data gap in evaluating impacts from well stimulation treatments (CCST, 2014, pg. 207). It is known that elements such as uranium, radium, and radon gas are present at low concentrations in soil and groundwater. The Monterey Formation is six times more enriched in uranium than the World Shale Average; however, the uranium content of crude oil in California is not "typically high" (CCST, 2014, pg. 206). No information about organic constituents in flowback and produced water from well stimulation treatments was identified by CCST. However, organic constituents in produced water from conventional oil and gas operations typically include polycyclic aromatic hydrocarbons (PAHs), phenols, and volatile organic compounds (VOCs) such as BTEX and naphthalene (CCST, 2014, pg. 207).

Notwithstanding these limitations and data gaps, the chemical composition of flowback (and associated formation fluids) indicates that groundwater quality could be impacted if these fluids were released or migrated into protected groundwater. This is evidenced by constituents with concentrations above drinking water standards or the presence of other constituents (e.g., methane or salts) that could degrade groundwater quality. The impact analysis focuses on potential pathways for these fluids to reach protected groundwater as described below.

Potential Release Pathways

Potential release pathways include both surface and subsurface releases.

Surface Release Pathways

Surface spills and leaks can occur during the transport of chemicals, during pre-stimulation chemical mixing, or during well stimulation treatment (CCST, 2014, pg. 210). These releases can be caused by a number of mechanisms, including tank ruptures, piping failures, blowouts, equipment failures, overfills, fires, vandalism, accidents or improper operations (CCST, 2014, pg. 210). Based on spill data collected by the EPA, there were 457 spills in 11 different states from January 2006 to April 2012 related to hydraulic fracturing (EPA, 2016). Of these 457 spills, 151 occurred during chemical mixing and 225 occurred as releases of produced water.

The storage and disposal of flowback and produced water at the surface can also result in accidental surface releases to the environment. Between January 2009 and February 2014, there were over 400 reported surface spills at oil and gas fields in California caused primarily by tank corrosion and sensor failures which released close to 3 million gallons of flowback/produced water (CCST, 2014, pg. 211). There is also evidence that the disposal of flowback and/or produced water in unlined pits has led to groundwater impacts in the United States and in California (CCST, 2015b, pg. 112). As of April 2015, there were 933 unlined pits identified in California, 62 percent of which were active (CCST, 2015b, pg. 110). Approximately one-third of the active pits were operating without appropriate permits from the Central Valley Regional Water Quality Control Board (CVRWQCB) (CCST, 2015b, pg. 110). Illegal discharges have occurred as illustrated by the $60,000 fine issued by the CVRWQCB to Vintage Production California LLC for discharging saline water, formation fluids, and hydraulic fracturing fluids into an unlined sump for 12 days (CCST, 2014, pg. 215).

Section 1786 of the SB 4 Well Stimulation Treatment Regulations prohibits the disposal of flowback water to sumps or pits in California and requires that flowback water be stored in containers. SB 4 also requires secondary containment and mitigation that would reduce any impacts from surface spills. Section 1786 of the SB 4 Well Stimulation Treatment Regulations also requires that operators be in compliance with all applicable testing, inspection, and maintenance requirements for production facilities that are storing and handling well stimulation fluids.

Another potential surface release mechanism is the reuse of produced water for irrigated agriculture. Although this would not be conducted on CCFO public lands, there is growing interest in this practice in the region. Produced water from five oil and gas fields in the San Joaquin Valley (Deer Creek, Jasmin, Kern River, Kern Front, and Mount Poso), two of which have undergone hydraulic fracturing (Kern River and Mount Poso), have been used to irrigate crops. The potential reuse of produced water from well stimulation is problematic because of the chemicals in well stimulation fluid that are known to be toxic in addition to those chemicals whose toxicity is unknown (CCST, 2015b, pg. 114), as well as chemicals that occur naturally in produced water from the formation.

Subsurface Release Pathways

CCST identifies potential subsurface pathways for well stimulation fluids. One potential subsurface pathway is that well stimulation may create a fracture that connects to a higher permeable zone or to existing faults or abandoned wells (CCST, 2014, pg. 217; CCST, 2015b, pg. 117) that would allow for migration of well stimulation fluid. CCST (2014, pg. 219; and 2015b, pg. 121) notes a study that suggests a minimum separation of 2,000 feet is recommended between shale reservoirs and overlying groundwater resources. In California, however, many wells undergoing well stimulation are less than 2,000 feet deep. CCST, therefore, concludes that the potential for induced fractures to reach groundwater aquifers may be higher in California than in other states (CCST, 2014, pg. 220). Nationwide, the EPA indicates that 20 percent of the 23,000 wells hydraulically fractured in 2009 and 2010 had less than a 2,000-foot separation between the point of shallowest hydraulic fracturing and protected water (EPA, 2016).

The SB 4 regulations require an analysis of suspected faults prior to well stimulation to identify and analyze any potential for hydraulic fracturing fluid to migrate outside of the zone being fractured. SB 4 regulations require a review of all geologic features, including known faults that are active or inactive, within five times the axial dimensional stimulation area (ADSA)[1].

Another potential subsurface pathway for well stimulation fluids is migration in the well or well annuli between the casing and the formation. Failure of cement and casing strings may allow pressurized gas and fluids from the producing zones to migrate upwards along the well and into protected groundwater. Poor well construction and uncemented casing are cited as the most important mechanisms leading to gas and fluid migration (CCST, 2014, pg. 224). The USGS summaries of published scientific work (Taylor et al., 2014) highlights this conclusion. Additionally, the USGS notes that the pathways by which fluids associated with well stimulation practices can affect potentially protected groundwater can be the same as those by which all oil and gas operations, including enhanced oil recovery practices, can have effects (Taylor et al., 2014). The USGS notes that published research has identified leaky wellbores as the most common pathway for contaminants from oil and gas activities to migrate to groundwater resources (Taylor et al., 2014). The USGS further notes that of the 168 active oil and gas fields in California greater than two square miles in size, 31 contain more than 100 wellbores per square mile (Taylor et al., 2014). A large number of potential contaminant pathways would exist if only a small percentage of wellbores were compromised (Taylor et al., 2014). In fact, over one million wells may have been drilled in the United States before well construction was regulated; the status and location of many of these wells are unknown (EPA, 2016). Based on a nationwide well file review conducted by the EPA, at least 10 percent of the wells that underwent hydraulic fracturing were more than five years old (EPA, 2016). According to the EPA, there is a greater potential for casing or cement failures when older wells undergo hydraulic fracturing (EPA, 2016).

[1] ADSA refers to the Axial Dimensional Stimulation Area and is defined in SB 4 as the estimated axial dimensions, expressed as maximum length, width, height, and azimuth, of the area(s) stimulated by a well stimulation treatment (14 CCR, Chapter 4, Section 1781(f)).

Abandoned wells are a potential subsurface pathway for well stimulation fluids. CCST (2015b, pg. 122) indicates that there are more inactive wells in California than active wells. Based on data from DOGGR, there are approximately 221,000 wells in California, approximately 116,000 (52 percent) of which have been abandoned according to State standards (CCST, 2015b, pg. 122). There are 1,800 wells that were not abandoned properly and whose location is approximate and 388 wells whose status is unknown because they were constructed before 1976. Pre-1976 well records are only available in hard copy (CCST, 2015b, pg. 122). SB 4 requires operators to locate abandoned wells, but does not require operators to test the condition of the abandoned wells. However, during the well stimulation application review process, DOGGR assesses wellbores, including abandoned wells, near the proposed treatment location and has the discretion to deny a permit if there is a high risk. CCST describes a U.S. Government Accountability Office (GAO) report conducted in 1989 about Class II injection wells across the country in which cases of groundwater contamination were caused by the communication between the injection well and improperly abandoned wells. GAO indicates that 70 percent of injection wells were constructed before 1976, when permitting requirements began to require a search for abandoned wells within one quarter mile of a newly proposed injection well bore (CCST, 2014, pg. 225). Wells constructed before 1976 were grandfathered into the program without requiring knowledge of nearby abandoned wells. In California, most of the disposal of flowback fluids occurs in Class II injection wells that inject fluids back into the hydrocarbon zones for enhanced oil recovery (EOR). To convert a formerly oil producing well into an injection well, the BLM would approve a Sundry Form 3160-5.

Despite the increased focus on well stimulation by the scientific research community within the last few years, the CCST reports state that the scientific understanding of well stimulation impacts is not currently well established (CCST, 2014, pg. 231; CCST, 2015b; pages 166-167). CCST (2015b, pg. 167) states that there is not enough data to either confirm or deny that surface and groundwater resources have been impacted by well stimulation. The EPA notes that the evaluation of potential impacts is inhibited by the lack of water quality data before and after a well is hydraulically fractured, lack of well mechanical integrity data, presence of other sources of contamination which make proving a direct link to hydraulic fracturing difficult, and lack of publicly available information on hydraulic fracturing activities (EPA, 2016).

The SB 4 Final EIR (DOC, 2015) focused on potential subsurface pathways along wells or wellbores, including the well subject to well stimulation and other existing wells/wellbores within the zone of influence (generally referred to in SB 4 regulations as the ADSA). These wells or wellbores, if not effectively sealed, could potentially serve as a conduit for upward migration of well stimulation fluids (including gas) into protected groundwater. Specifically, the analysis noted that wells in oil and gas fields are drilled through groundwater resources that may overlie the hydrocarbon zones, and, as such, provide a continuous physical connection between well stimulation target zones and protected groundwater. If a pathway from the target zone to protected groundwater is completed along a wellbore, fluid travel times and volumes are not restricted by confining layers in the same manner as would occur naturally in the absence of the wellbore.

The SB 4 regulations have requirements for well seals to prevent the migration of gas and fluids from the produced zone to protected groundwater. The SB 4 regulations require cement placement in surface casing from the base of the casing to the surface and preferably through the freshwater zone (3,000 mg/L). The State's Final EIR (DOC, 2015) includes a mitigation measure (MM-GW-4b) requiring a 500-foot well seal across the base of protected water if the hydraulic fracturing zone is below the base of the protected water. If the hydraulic fracturing zone is within protected water, then this mitigation measure requires a well seal along the entire casing string, from the bottom of the well to the surface.

Based on the material provided in these collective analyses and the number of wells in most oil and gas fields, wells appear to represent the most probable potential subsurface pathway for well stimulation liquids and gases to reach protected groundwater. Further, the primary factor affecting the well-related pathway is

the mechanical integrity of the well, and in particular, the placement and effectiveness of cement seals in the annulus between the well casing and the geologic formation.

Potential impacts to protected groundwater quality associated with migration of well stimulation fluids and formation fluids (including gas) along surface and subsurface pathways are applicable to all alternatives associated with the RMP/EIS.

Impacts Minimized by Recent Regulations

BLM regulations, onshore orders, and standard leasing stipulations (See Appendix C and J) help reduce impacts to groundwater quality. Additionally, recent State regulations regarding well stimulation address these potential impacts and, at least in part, serve to mitigate the impacts discussed above on groundwater quantity and quality. State regulations include the Well Stimulation Treatment Regulations adopted by DOGGR in July 2015 in compliance with SB 4. These regulations contain numerous protective measures for groundwater quality based on isolating the well stimulation target zone from groundwater resources. Per 14 CCR Section 1784(a)(3), operators currently are required to identify faults within five times the ADSA of a proposed stimulation treatment and evaluate whether the feature may act as a pathway; Operators must assess the risk that the stimulation treatment could communicate with the feature. A summary of the key protective measures in the regulations was provided in the Final EIR (DOC, 2015, see Section 10.14.5 Impact Analysis and Mitigation Measures for Groundwater Resources). Also included in the Final EIR were mitigation measures to work in combination with SB 4 regulations to mitigate potential impacts to both groundwater quantity and groundwater quality on a programmatic basis. The proposed mitigation measures — along with the permanent SB 4 regulations — are considered to mitigate potential impacts to groundwater from well stimulation treatments.

In addition, SB 4 requires groundwater monitoring to track the performance of the regulations and mitigation in protecting groundwater resources. Model Criteria for groundwater monitoring in areas of oil and gas stimulation were finalized in July 2015. These Model Criteria were used to implement a regional groundwater monitoring program which began in January 2016.

Collectively, the DOGGR regulations and the mitigation measures provided in the Final EIR, serve to reduce potential impacts to the quantity or quality of protected groundwater. The regulations are applicable to all alternatives associated with the RMPA/EIS.

4.7.3 Impacts of Alternative A (No Action)

Under Alternative A, the No Action Alternative, the areas currently open for oil and gas leasing would remain open and the areas closed under the 2007 RMP would remain closed. Areas that remain closed include designated wilderness, wilderness study areas (WSAs), Fort Ord National Monument, and Clear Creek Serpentine Area of Critical Environmental Concern (ACEC). Figure 4.7-1 illustrates groundwater basins with respect to the Federal mineral estate that is open, open with no surface occupancy (NSO) restrictions, and closed to oil and gas leasing under Alternative A.

Groundwater basins on Federal mineral estate that is open and open with NSO restrictions can potentially be impacted under this alternative. Federal mineral estate that is open with NSO restrictions can be impacted by directional or horizontal drilling from nearby surface lands.

As shown on Table 4.7-3, portions of all 20 groundwater basins containing Federal mineral estate are open to oil and gas leasing in Alternative A. These groundwater basins are in seven counties within the CCFO Planning Area: Alameda, Contra Costa, Fresno, Merced, Monterey, San Benito, and Santa Cruz. As summarized on Table 4.7-3, four of these groundwater basins/subbasins were assigned a high CASGEM priority ranking and are on the List of Critically Overdrafted Groundwater Basins, released January 2016: Delta-Mendota (5-22.07), Westside (5-22.09), Paso Robles (3-4.06), and Pajaro Valley (3-2). A description

Table 4.7-3. Groundwater Basins with Federal Mineral Estate Associated with Each Alternative

DWR Groundwater Basin / Subbasin[1]			County[2]	CDWR Priority Ranking[3]	Alternatives: Groundwater Basins that Contain Open Federal Mineral Estate[4]					
Basin Name	Subbasin Name	Number			A	B	C	D	E	F
Santa Clara Valley	Niles Cone	2-9.01	Alameda	medium	X	—	—	—	—	X
Clayton Valley	—	2-5	Contra Costa	very low	X	X	X	—	—	X
San Joaquin Valley	Tracy	5-22.15		medium	X	X	X	—	—	X
San Joaquin Valley	Delta-Mendota	5-22.07	Fresno	high*	X	—	X	X	—	X
	Pleasant Valley	5-22.10		low	X	X	X	X	—	X
	Westside	5-22.09		high*	X	X	X	X	—	X
Cholame Valley	—	3-5	Monterey	very low	X	—	X	—	—	X
Lockwood Valley	—	3-6		very low	X	—	X	—	—	X
Peach Tree Valley	—	3-32		very low	X	—	—	—	—	X
Salinas Valley	Forebay Aquifer	3-4.04		medium	X	X	X	X	—	X
	Upper Valley Aquifer	3-4.05		medium	X	—	X	—	—	X
	Paso Robles Area	3-4.06		high*	X	—	X	X	—	X
Bitterwater Valley	—	3-30	San Benito	very low	X	—	X	—	—	X
San Benito River Valley	—	3-28		very low	X	—	—	—	—	X
Gilroy–Hollister Valley	San Juan Bautista Area	3-3.04		medium	X	—	X	—	—	X
Hernandez Valley	—	3-31		very low	X	—	—	X	—	X
Panoche Valley	—	5-23		very low	X	—	X	X	—	X
Vallecitos Creek Valley	—	5-71		very low	X	X	X	X	—	X
Santa Cruz Purisima Formation	—	3-21	Santa Cruz	medium	X	—	—	—	—	X
Pajaro Valley	—	3-2		high*	X	—	—	—	—	X

1 – Based on CDWR, 2003
2 - No groundwater basins with Federal mineral estate in San Francisco, San Joaquin, San Mateo, Santa Clara, or Stanislaus Counties.
3 - As part of the CASGEM basin prioritization process.
4 - Also includes Federal mineral estate that is Open with Restrictions (No Surface Occupancy).
*On Draft List of Critically Overdrafted Groundwater Basins.

of each of the groundwater basins is provided in Section 3.7.4. As described in the 2015 RFD Scenario, up to 37 oil and gas wells could be drilled in the next 15 to 20 years, 32 of which are expected to be within existing oil and gas fields and 3 to 5 outside of existing oil and gas fields. As summarized in Table 4.7-3, oil and gas fields intersect groundwater basins in Contra Costa, Fresno, Monterey, and San Benito Counties.

All of the impacts associated with groundwater quantity and quality described in Section 4.7.2 are applicable to Alternative A. In addition, no new impacts to protected groundwater are identified that are specific only to this alternative. However, the four critically overdrafted groundwater basins/subbasins assigned a high CASGEM priority ranking that contain open Federal mineral estate under this alternative would be particularly vulnerable to groundwater quality and quantity impacts. Alternative A and Alternative F are the only alternatives that have open mineral estate in all 20 groundwater basins with Federal mineral estate, including the four high-priority and critically overdrafted basins.

Appendix C provides a list of the Central Coast Oil and Gas Stipulations that would help reduce the effects to groundwater resources. Additionally, all of the mitigation measures from the DOGGR Final EIR discussed in Section 4.7.2 are applicable to Alternative A. No additional mitigation measures are necessary to mitigate impacts associated with this alternative. Collectively, the DOGGR SB 4 permanent regulations and the mitigation measures in the DOGGR SB 4 Final EIR (DOC, 2015) mitigate the potential impacts to quantity and quality of protected groundwater in the CCFO Planning Area.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A, the leases subject to the settlement agreement would be open to leasing and would be issued. As discussed in Section 3.7.4, some of the leases overlie small portions of two groundwater basins — the Salinas Valley, Paso Robles Area groundwater subbasin (3-4.06) in the Monterey County portion of the subbasin (Leases CACA 052960) and the Vallecitos Creek Valley groundwater basin (5-71) in San Benito County (Leases CACA 053828, 053830, 053831, and 053835). The Paso Robles Area groundwater basin is assigned a high-priority ranking in the CASGEM program and would be particularly vulnerable to groundwater quality and quantity impacts. Potential groundwater quality and quantity impacts to these groundwater basins would be similar to those described in Section 4.7.2 (Impacts Common to All Alternatives).

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impact would occur.

4.7.4 Impacts of Alternative B

Under Alternative B, Federal mineral estate within the boundaries of oil and gas fields, plus a 0.5-mile buffer, would be open for oil and gas leasing and the remaining areas would be closed. Controlled surface use (CSU) stipulations would apply to all land open to oil and gas leasing. Figure 4.7-2 illustrates the groundwater basins with respect to Federal mineral estate that is open, open with NSO restrictions, and closed to oil and gas leasing under Alternative B.

Approximately 96 percent of the Federal mineral estate is closed to oil and gas leasing under Alternative B. Up to 32 development wells are expected to be drilled in the next 15 to 20 years under Alternative B. Well drilling would be conducted within the boundaries and buffer of existing oil and gas fields. Because water-intensive wells could also be drilled within an oil and gas field, no changes are made for assumptions on water use per well for potential impacts to groundwater quantity. As shown in Table 4.7-3, 6 of the 20 groundwater basins that intersect Federal mineral estate are open to oil and gas leasing. These groundwater basins are in four counties: Contra Costa, Fresno, Monterey, and San Benito. As summarized on Table 4.7-3, Westside subbasin is the only groundwater basin with open Federal mineral estate that has a high-priority ranking under the CASGEM program. This subbasin would be particularly vulnerable to

groundwater quality and quantity impacts under this alternative. However, Alternative B involves fewer groundwater basins than any other alternative except Alternative E. Further, of the six basins involved, only three are associated with either a medium- or high-priority ranking under the CASGEM program. A description of each of the groundwater basins is provided in Section 3.7.4.

All of the impacts associated with groundwater quantity and quality described in Section 4.7.2 are applicable to Alternative B. In addition, no new impacts to protected groundwater are identified that are specific only to this alternative.

Appendix C provides a list of the Central Coast Oil and Gas Stipulations that would help reduce the effects to groundwater resources. Additionally, all of the mitigation measures from the DOGGR Final EIR discussed in Section 4.7.2 are applicable to Alternative B. No additional mitigation measures are necessary to mitigate impacts associated with this alternative. Collectively, the DOGGR SB 4 permanent regulations, and the mitigation measures in the DOGGR SB 4 Final EIR (DOC, 2015) mitigate the potential impacts to quantity and quality of protected groundwater in the CCFO Planning Area.

Leases Subject to Settlement Agreement

Under Alternative B, only a small portion of the leases subject to the settlement agreement would be open to oil and gas leasing. The leases subject to the settlement agreement in Monterey County would not overlie oil and gas fields, and therefore, would be closed to oil and gas leasing under this alternative. In San Benito County, the leases that are within or overlap portions of the Vallecitos oil and gas field would be open to oil and gas leasing. Portions of these open leases intersect the Vallecitos Creek Valley groundwater basin (5-71) (Leases CACA 053828, 053830, 053831, and 053835). Potential groundwater quality and quantity impacts to the Vallecitos Creek Valley groundwater basin would be similar to those described in Section 4.7.2 (Impacts Common to All Alternatives).

4.7.5 Impacts of Alternative C

Under Alternative C, Federal mineral estate in high oil and gas potential areas or within the boundaries and 0.5-mile buffer of oil and gas fields would be open to oil and gas leasing, with the exception of core population areas of the giant kangaroo rat in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills which are closed to leasing. Areas with no, low or moderate oil and gas potential would be closed to leasing. Areas closed under the 2007 RMP would remain closed. CSU stipulations, see Appendix C, would apply to all land open to oil and gas leasing. NSO stipulations, see Appendix C, would apply to some lands open to leasing, including: (1) threatened and endangered species critical habitat; (2) BLM developed recreation and administrative sites; and (3) special status split estate lands (e.g., state parks, county parks, conservation easements, land trusts, and scenic designations). Figure 4.7-3 illustrates the groundwater basins with respect to the Federal mineral estate that is open, open with NSO restrictions, and closed to oil and gas leasing under Alternative C.

Slightly more than half (54 percent) of the Federal estate is open to oil and gas leasing. Under Alternative C, up to 37 wells projected to be drilled in the next 15 to 20 years could be drilled in areas of high oil and gas potential or with the boundaries and buffer of oil and gas fields.

As shown on Table 4.7-3, 14 of the 20 groundwater basins that contain Federal mineral estate in the CCFO are subject to oil and gas leasing. These groundwater basins are in Contra Costa, Fresno, Merced, Monterey, and San Benito Counties. As summarized on Table 4.7-3, there are three groundwater subbasins with open Federal mineral estate that have a high-priority ranking from the CASGEM program: Delta-Mendota (5-22.07), Westside (5-22.09), and Paso Robles (3-4.06). These subbasins would be particularly vulnerable to groundwater quality and quantity impacts under this alternative. A description of each of the groundwater basins is provided in Section 3.7.4. Alternative C involves fewer groundwater basins than Alternative A and Alternative F, but more than Alternatives B, D and E.

All of the impacts associated with groundwater quantity and quality described in Section 4.7.2 are applicable to Alternative C. In addition, no new impacts to protected groundwater are identified that are specific only to this alternative.

Appendix C provides a list of the Central Coast Oil and Gas Stipulations that would help reduce the effects to groundwater resources. Additionally, all of the mitigation measures from the DOGGR Final EIR discussed in Section 4.7.2 are applicable to Alternative C. No additional mitigation measures are necessary to mitigate impacts associated with this alternative. Collectively, the DOGGR SB 4 regulations and the mitigation measures in the DOGGR SB 4 Final EIR (DOC, 2015) mitigate the potential impacts to quantity and quality of protected groundwater in the CCFO Planning Area.

Leases Subject to Settlement Agreement

Under Alternative C, the leases subject to the settlement agreement would be open to oil and gas leasing because of the occurrence of leases within high oil and gas potential areas. The leases subject to the settlement agreement in San Benito County would be, for the most part, either within the Vallecitos oil and gas field or within high oil and gas potential areas, and therefore would be open for oil and gas leasing. Small portions of the open leases intersect the Vallecitos Creek Valley groundwater basin (5-71) in San Benito County (Leases CACA 053828, 053830, 053831, and 053835) or the Salinas Valley, Paso Robles Area subbasin (3-4.06) in the Monterey County portion of the subbasin (Lease CACA 052960). The Paso Robles Area groundwater basin was assigned a high CASGEM priority ranking and would be particularly vulnerable to groundwater quality and quantity impacts. Potential groundwater quality and quantity impacts to these groundwater basins would be similar to those described in Section 4.7.2 (Impacts Common to All Alternatives).

4.7.6 Impacts of Alternative D

Under Alternative D, Federal mineral estate underlying BLM surface estate would be open for oil and gas leasing, while BLM split estate lands and Ciervo-Panoche Natural Area would be closed. Currently closed areas would remain closed. CSU stipulations would apply to all land open to oil and gas leasing. NSO stipulations would apply to ACEC and Recreation and Public Purpose (R&PP) lands. Figure 4.7-4 illustrates the groundwater basins with respect to Federal mineral estate that is open, open with NSO restrictions, and closed to oil and gas leasing under Alternative D.

Approximately 15 percent of the Federal mineral estate in the CCFO Planning Area would be open to oil and gas leasing under this alternative. As shown on Table 4.7-3, 8 of the 20 groundwater basins that intersect Federal mineral estate in the CCFO study area would be open to oil and gas leasing. These groundwater basins are in Fresno, Merced, Monterey, and San Benito Counties. As summarized on Table 4.7-3, there are three groundwater subbasins assigned a high CASGEM priority ranking that intersect open Federal mineral estate: Delta-Mendota (5-22.07), Westside (5-22.09), and Paso Robles (3-4.06). These subbasins would be particularly vulnerable to groundwater quality and quantity impacts under this alternative. A description of each groundwater basin is provided in Section 3.7.4. Alternative D involves fewer groundwater basins than Alternatives A, C and F, and more than Alternative B.

All of the impacts associated with groundwater quantity and quality described in Section 4.7.2 are applicable to Alternative D. In addition, no new impacts to protected groundwater are identified that are specific only to this alternative.

Appendix C provides a list of the Central Coast Oil and Gas Stipulations that would help reduce the effects to groundwater resources. Additionally, all of the mitigation measures from the DOGGR Final EIR discussed in Section 4.7.2 are applicable to Alternative D. No additional mitigation measures are necessary to mitigate impacts associated with this alternative. Collectively, the DOGGR SB 4 regulations and the

mitigation measures in the DOGGR SB 4 Final EIR (DOC, 2015) mitigate the potential impacts to quantity and quality of protected groundwater in the CCFO Planning Area.

Leases Subject to Settlement Agreement

Under Alternative D, most of the leases subject to the settlement agreement in both Monterey and San Benito Counties would be closed, but some would be open. In Monterey County, none of the open lease areas intersect groundwater basins. In San Benito County, portions of some of the leases (Leases CACA 053828, 053830, 053831, and 053835) intersect the Vallecitos Creek Valley groundwater basin (5-71). Potential groundwater quality and quantity impacts to these groundwater basins would be similar to those described in Section 4.7.2 (Impacts Common to All Alternatives).

4.7.7 Impacts of Alternative E

Under Alternative E, Federal mineral estate outside of groundwater basins would be open for oil and gas leasing, while Federal mineral estate within groundwater basins would be closed. Areas closed under the 2007 RMP would remain closed. CSU stipulations would apply to all land open to oil and gas leasing. NSO stipulations would apply to some open lands: (1) 12-digit Hydrologic Unit Codes (HUCs) intersecting EPA impaired, perennial surface waters; (2) 12-digit HUCs intersecting non-impaired, perennial surface waters that intersect split estate; (3) 12-digit HUC subwatersheds with the highest aquatic intactness score; (4) 0.25 miles from non-impaired perennial surface waters; and (5) 0.25 miles from eligible Wild and Scenic Rivers. Figure 4.7-5 illustrates the groundwater basins with respect to the Federal mineral estate that is open, open with NSO restrictions, and closed to oil and gas leasing under Alternative E.

Approximately 88 percent of the Federal mineral estate in the Central Coast Field Office study area would be open to oil and gas leasing under this alternative. By definition of the alternative, none of the open Federal mineral estate would intersect groundwater basins. Future well drilling would occur outside of groundwater basins.

All of the impacts associated with groundwater quantity and quality described in Section 4.7.2 are applicable to Alternative E, and no new impacts have been identified. However, the potential impacts to groundwater resources are considered to be less for wells outside of a groundwater basin. It is recognized that the risk is not completely eliminated because these areas may provide surface and subsurface recharge into an adjacent groundwater basin. Protected groundwater with beneficial uses can also exist outside of the designated groundwater basins. Nonetheless, the potential for impacts is considered higher for activities within a groundwater basin, making this alternative the most protective alternative for groundwater resources.

Appendix C provides a list of the Central Coast Oil and Gas Stipulations that would help reduce the effects to groundwater resources. Additionally, all of the mitigation measures from the DOGGR Final EIR discussed in Section 4.7.2 are applicable to Alternative E. No additional mitigation measures are necessary to mitigate impacts associated with this alternative. Collectively, the DOGGR SB 4 regulations and the mitigation measures in the DOGGR SB 4 Final EIR (DOC, 2015) mitigate the potential impacts to quantity and quality of protected groundwater in the CCFO Planning Area.

Leases Subject to Settlement Agreement

Under Alternative E, the portions of the leases subject to the settlement agreement that do not intersect groundwater basins are open to oil and gas leasing. Therefore, most of the leases in both Monterey and San Benito Counties are open to oil and gas leasing. Portions of the open leases intersect the Vallecitos oil and gas field in San Benito County. However, portions that overlie the groundwater basin are excluded, thereby minimizing potential groundwater quality and quantity impacts to these groundwater basins.

4.7.8 Impacts of Alternative F

Under Alternative F, Federal mineral estate would be open to oil and gas leasing unless currently closed under the 2007 Hollister Field Office RMP. CSU stipulations would apply to all land open to oil and gas leasing. NSO stipulations would apply to some lands open to leasing, including: (1) Joaquin Rocks ACEC; (2) ACECs within Ciervo-Panoche Natural Area; and (3) giant kangaroo rat core population areas.

Figure 4.7-6 illustrates the groundwater basins with respect to the Federal mineral estate that is open, open with NSO restrictions, and closed to oil and gas leasing under Alternative F.

Groundwater basins on Federal mineral estate that are open and open with NSO restrictions can potentially be impacted under this alternative. Federal mineral estate that is open with NSO restrictions can be impacted by directional or horizontal drilling from nearby surface lands.

As shown on Table 4.7-3, portions of all 20 groundwater basins containing Federal mineral estate are open to oil and gas leasing in Alternative F. These groundwater basins are in seven counties within the CCFO Planning Area: Alameda, Contra Costa, Fresno, Merced, Monterey, San Benito, and Santa Cruz. As summarized on Table 4.7-3, four of these groundwater basins/subbasins were assigned a high CASGEM priority ranking and are on the List of Critically Overdrafted Groundwater Basins, released January 2016: Delta-Mendota (5-22.07), Westside (5-22.09), Paso Robles (3-4.06) and Pajaro Valley (3-2). A description of each of the groundwater basins is provided in Section 3.7.4. As described in the 2015 RFD Scenario, up to 37 oil and gas wells could be drilled in the next 15 to 20 years, 32 of which are expected to be within existing oil and gas fields and 3 to 5 outside of existing oil and gas fields. As summarized in Table 3.7-3, oil and gas fields intersect groundwater basins in Contra Costa, Fresno, Monterey, and San Benito Counties.

All of the impacts associated with groundwater quantity and quality described in Section 4.7.2 are applicable to Alternative F. No new impacts to protected groundwater are identified that are specific only to this alternative. However, the four critically overdrafted groundwater basins/subbasins assigned a high CASGEM priority ranking that contain open Federal mineral estate under this alternative would be particularly vulnerable to groundwater quality and quantity impacts. Alternative A and Alternative F are the only alternatives that have open mineral estate in all 20 groundwater basins with Federal mineral estate, including the four high priority and critically overdrafted basins.

Appendix C provides a list of the Central Coast Oil and Gas Stipulations that would help reduce the effects to groundwater resources. Additionally, all of the mitigation measures from the DOGGR Final EIR discussed in Section 4.7.2 are applicable to Alternative F. No additional mitigation measures are necessary to mitigate impacts associated with this alternative. Collectively, the DOGGR SB 4 regulations and the mitigation measures in the DOGGR SB 4 Final EIR (DOC, 2015) mitigate the potential impacts to quantity and quality of protected groundwater in the CCFO Planning Area.

Leases Subject to Settlement Agreement

Under Alternative F, the leases subject to the settlement agreement would be open to leasing and would be issued. Some of the leases overlie small portions of two groundwater basins — the Salinas Valley, Paso Robles Area groundwater subbasin (3-4.06) in Monterey County portion of the subbasin (Lease CACA 052960) and the Vallecitos Creek Valley groundwater basin (5-71) in San Benito County (Leases CACA 053828, 053830, 053831, and 053835). The Paso Robles Area groundwater basin is assigned a high-priority ranking in the CASGEM program and would be particularly vulnerable to groundwater quality and quantity impacts. Potential groundwater quality and quantity impacts to these groundwater basins would be similar to those described in Section 4.7.2 (Impacts Common to All Alternatives).

4.8 Surface Water Resources

4.8.1 Introduction

Approach to Impact Assessment

All of the alternatives would involve the development of the 2015 RFD Scenario. For all but Alternative B, up to 37 exploratory and development wells would be developed within the Federal mineral estate lands, with the potential for the use of well stimulation and enhanced oil recovery techniques. Alternative B has an RFD Scenario of up to 32 wells.

As a result of ground disturbance associated with the development of new production facilities and associated access and infrastructure, construction-related impacts could occur to surface water quality, sediment and erosion, flooding and water supply. Post-construction operation and production activities could also impact surface water quality, sediment and erosion, flooding, and water supply.

Areas subject to NSO stipulations are assumed to generate no surface water impacts except as may occur from subsurface use, covered in Section 4.7, Groundwater Resources. NSO restrictions are intended to minimize or eliminate adverse effects on unique or significant natural resources that are incompatible with fluid mineral development. No new surface disturbing activity is allowed unless the action is determined to not impair the values present.

Relevant management actions to protect surface water resources from the 2007 RMP include:

- **SOIL-COM1.** Require an approved erosion control strategy and topsoil segregation/restoration plan for proposals involving surface disturbance on slopes of 20 to 40 percent. Such construction must be properly surveyed and designed by a certified engineer and approved by the BLM before construction and maintenance. No surface disturbance on slopes greater than 40 percent would be allowed unless it is determined that it would cause a greater impact to pursue other alternatives.
- **SOIL-COM2.** Require a topsoil segregation/restoration plan be submitted to and approved by the BLM before construction and maintenance actions that would disturb the surface of soils considered to have poor topsoil suitability or restoration potential.
- **SOIL-COM3.** Close roads and trails to public use during periods of extreme wet weather in areas where sustained public use may compromise the integrity of the road or trail surface.
- **SOIL-COM4.** Implement soil loss assessment procedures for road and trail maintenance.
- **SOIL-COM5.** Implement best management practices (BMPs) for non-point source pollution control.
- **WAT-COM1.** Implement BMPs at the activity-plan or project level to prevent degradation of water quality.
- **WAT-COM2.** Maintain existing developed water sources (i.e., spring developments and reservoirs). Develop new sources on a case-by-case basis through project-level planning.
- **WAT-COM3.** Maintain adjudicated water rights; inventory water sources not adjudicated or water rights sought, where applicable.
- **WAT-COM4.** Manage CWA 303(d)-listed impaired water bodies to meet properly functioning condition (PFC) objectives relative to beneficial uses and total maximum daily loads (TMDLs).
- **WAT-COM5.** Maintain stable watershed conditions and implement passive and active restoration projects to protect beneficial uses of water and meet TMDLs.

- **WAT-COM6.** Work with Regional Water Quality Control Boards, Coordinated Resource Management Planning groups, and other private landowners or non-profit organizations to prioritize watershed improvement projects and establish monitoring programs to prevent water bodies from reaching impairment levels that would result in listing under CWA 303(d).
- **WAT-COM7.** Limit authorized uses and management activities to those that do not cause irreversible, irreparable impacts to water quality and watershed function.
- **WAT-COM8.** Periodically monitor water quality in seasonal pools and perennial ponds containing known or suspected threatened and endangered (T & E) species. Identify water quality issues and initiate repairs, within environmental constraints.
- **WAT-B2.** Submit request to the California State Department of Water Resources to establish Federal water reserves on acquired lands to ensure water availability for multiple use management and for functioning, healthy, riparian, and upland systems.
- **WAT-C1.** Manage all fluvial systems functioning at risk to meet PFCs.

BLM Best Management Practices (BMPs) and Oil and Gas Standard Operating Procedures for water resources (listed in Appendix D) aim to control water pollution and reduce the potential for water contamination by implementing the following:

- Erosion and sediment control measures.
- Restoration of damaged wetlands or riparian areas where restoration of such systems will abate polluted runoff.
- Road construction/reconstruction, use, and management conducted to reduce sediment generation and delivery.
- Onsite confinement of runoff to reduce impacts of mechanical site preparation.
- Revegetation and restoration of disturbed areas.
- Prohibition of chemical applications or storage within 100 feet of perennial streams or channels with beneficial use(s) recognized by the State, or directly into intermittent streams or channels with beneficial use(s) recognized by the State.
- Compliance with the California General Construction Storm Water Permit, meaning all projects 1 acre in size or more require a Stormwater Pollution Prevention Plan.

BLM is unable to quantify impacts to surface water resources from the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.8. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects to surface water resources from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground. Other incomplete or unavailable information includes the type(s) of development(s) and site-specific resource conditions because it's impossible for BLM to know how, where, or when leases would be developed.

For example, BLM is unable to quantify effects to surface water under the range of alternatives because the timing, intensity, and/or location of future leasing and development activities is not available or attainable.

Therefore, the evaluation of such impacts is based on current resource conditions described in Section 3.7, and the regulatory framework for water resources described in Appendix J.

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of federal minerals in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99 percent) of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. The CCST report also indicates the majority of oil and gas activity in the planning area entails conventional well drilling. The CCST report suggests the potential for future operations to include enhanced well stimulation techniques is low because previous attempts to extract resources using hydraulic fracturing have not been productive or economical. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects of future leasing and development on water resources in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

4.8.2 Impacts Common to All Alternatives

Surface Water Quality

Construction of new wells and ancillary facilities would involve the use of heavy equipment to build, clear, and grade access roads, electric transmission lines, and pipelines. Disturbance of soil during construction has the potential to reduce surface water quality through the introduction of disturbed sediments into local streams or other water bodies. Sediments could be deposited directly into streams by construction, or be subsequently washed in by runoff from the disturbed areas. Accidental spills or disposal of potentially harmful materials used during construction and, if applicable, well stimulation or enhanced oil recovery, could occur as a result of on-site refueling and equipment maintenance activities, leaks from defective or poorly maintained equipment, or other construction-related activities. (Upset conditions are addressed in Section 4.4, Hazardous Materials and Public Safety.) Examples of potential construction-related pollutants include diesel fuel, gasoline, lubrication oil, hydraulic fluids, anti-freeze, transmission fluid, lubricating grease, drilling mud, well stimulation fluid additives (of which little is known of some of the chemical constituents (CCST, 2014; pg. 189-190)), flowback fluids and overflush from well stimulation treatments, and trash. Pollutants could reach surface waters directly, be transported by runoff into a water body, or enter surface water through flooding of the well site. Under the RFD Scenario of 37 wells, the total disturbance area subject to construction impacts would be approximately 206 acres.

The beneficial uses of surface waters near the existing oil and gas field with the highest potential for development could be affected by water quality degradation. For example, most surface waters in the area include some or all of the following designated beneficial uses: Wildlife Habitat, Warm Freshwater Habitat, and Migration of Aquatic Organisms. Degradation of surface water quality, and alteration of stream geomorphology and riparian structure, could occur with oil well development in and near surface waters and thereby affect these and other beneficial uses listed in Section 3.8.4 and in the RWQCB Basin Plans.

Oil and gas production activities have the potential for contamination of surface water, mainly through ongoing maintenance activities, with similar effects as construction, and through spills of oil, produced water and other fluids used in the operations process. (See Section 4.4, Hazardous Materials and Public Safety.) An approximate indication of expected future spills can be derived from reported spills in the past. Spills are reported to the California Office of Emergency Services (OES). From 1993 to 2014, about 7,833 spills were reported in oil fields statewide. About 12 percent of these were reported as in or potentially affecting inland surface waters (CALOES, 2015). Oil field spills reported to OES averaged roughly 39 barrels, with a median of about 6 barrels. Roughly 95% had been contained at the time of reporting.

Approximately one spill per year for every 178 active oil wells can be anticipated, based on past spills in the CCFO Planning Area of Monterey and San Benito Counties during a representative year (2013). This spill rate is based on DOGGR data of 711 active oil wells in those two counties that year (DOGGR, 2013) and four OES-reported spills in oil fields for that year and those counties (CALOES, 2015). These spills could induce water quality impacts to in-stream beneficial uses related to habitat, fish and wildlife, and recreation, as well as to downstream municipal and domestic uses if contaminants reach streams or reservoirs that are used for water supply.

Clean Water Act (CWA) and State of California regulations, applicable under all alternatives, as described in Section 3.8.2, protect surface water beneficial uses by regulating point source and certain non-point source discharges to surface water. Construction-related and industrial (production-related) discharges to surface waters would require implementation of CWA-compliant pollutant controls using best available technology (BAT) economically achievable for toxic pollutants and non-conventional pollutants and best conventional pollutant control technology (BCT) for conventional pollutants. Examples of BAT and BCT control technologies include runoff control, soil stabilization, sediment control, proper stream crossing techniques, waste management, spill prevention and control, and a wide variety of other measures depending on the site and situation. The BLM demonstrates compliance with the Clean Water Act and State water quality objectives by implementing BMPs that are consistent with measures required by the State.

Compliance with the Clean Water Act would include compliance with Section 404 regulating discharges into the Waters of the U.S., including wetlands. Jurisdictional determinations under Section 404 will be required on a project level. Compliance involves avoidance, minimization and mitigation of any impacts. This issue is addressed further in Section 4.10 of this report.

California Code of Regulations Title 14, administered by DOGGR, has oilfield-specific surface water protections, which include, but are not limited to: prohibitions from locating oilfield sumps in natural drainage channels, secondary containment requirements for all production facilities storing and or processing fluids, installation and maintenance of a leak detection system, replacement of tank bottoms, and proper management and disposal of oilfield wastes and refuse. Additional regulations, including Clean Water Act Sections 401 and 404, and Sections 1600–1616 of the California Fish and Game Code, protect the natural riparian and ecological functions of surface waters through requiring avoidance and minimization of impacts to surface waters, and mitigation for impacts that are unavoidable. These surface water protections under the Clean Water Act establish the basic regulatory standards for preventing and mitigating adverse impacts of surface water impairments attributable to oil field activities.

In the event of well stimulation, water quality impacts are similar to those described above, with the addition of the potential for well stimulation and flowback fluids, including fluid additives, to be introduced to surface waters either by direct disposal or by accidental spill. Fluid additives may include a variety of compounds that, if introduced to surface waters, could damage beneficial uses.

For all oil and gas development, relevant Central Coast BMPs and SOPs (see Appendix D) require:

- Protecting the existing water quality improvement functions of wetlands and riparian areas as a component of NPS programs. Damaged wetlands or riparian areas are to be restored where restoration of such systems will abate polluted runoff.
- Point discharge of potential water pollutants onto the ground surface is to be prevented.
- Do not apply or store chemicals within 100 feet of perennial streams or channels with beneficial use(s) recognized by the State.
- Operators are required to obtain all required State and Federal permits for the protection of groundwater and surface water quality.

- Depleted wells are to be plugged and abandoned in a timely manner. This includes plugging the well bore with cement, removing all materials and equipment, and recontouring/revegetation as specified in the conditions of approval.
- Sufficiently impervious secondary containment, such as containment dikes, containment walls, and drip pans, should be constructed and maintained around all qualifying petroleum facilities, including tank batteries and separation and treating areas consistent with the Environmental Protection Agency's Spill Prevention, Control, and Countermeasure regulation (40 CFR 112). The appropriate containment and/or diversionary structure would be sufficiently impervious to oil, glycol, produced water, or other fluid and would be used at the site so that any spill or leakage would not drain, infiltrate, or otherwise escape to the ground, surface, or navigable waters before clean-up is completed.
- Proper containment of oil and produced water in tanks, drilling fluids in reserve pits, and locating staging areas away from drainages would prevent potential contaminants from entering surface waters.
- Chemical containers should not be stored on bare ground or exposed to the sun or moisture. Labels must be readable. Chemical containers should be maintained in good condition and placed within secondary containment in case of a spill or high velocity puncture. All secondary containment must be designed to preclude entry from wildlife and livestock.
- Consider the use of a closed loop drilling system. In the absence of a closed loop system, tanks and pits must be designed to preclude the entry of wildlife and livestock.
- Produced water from oil and gas operations would be disposed of in accordance with the requirements of Onshore Oil and Gas Order #7. Oil and Gas Order #7 requires that the operator not dispose of produced water unless and until approval is obtained from the authorized officer. All produced water must be disposed of by (1) injection into the substance; (2) into pits; or (3) other acceptable methods approved by the authorized officer, including surface discharge under NPDES permit. Injection is generally the preferred method of disposal. This order also includes specifications on the design, construction and maintenance of pits and injection wells.

In addition, Central Coast BMPs and SOPs for sediment, listed under the next heading, are relevant to water quality. BLM regulations (see Appendix J) and stipulations (see Appendix C) would also reduce impacts to water quality.

Well stimulation rules developed by DOGGR under SB 4 (Section 3.8.2) also have surface water protections which include spill prevention and countermeasure plans, water management plans, product and waste storage and disposal requirements, secondary containment requirements, notification, containment and clean-up requirements for accidental spills, and restoration requirements.

For alternatives other than Alternative A (No Action Alternative), CSU stipulations (Appendix C) require that on well stimulation projects the BLM be provided with the same information required by DOGGR for well stimulation treatment activities in permit applications under SB 4. Under the CSU stipulations, BLM may require the operator to move the proposed well more than 200 meters (656 feet), modify, or delay the well completion activity in order to minimize the potential for adverse impacts to water resources.

SB 4 (14 CCR Section 1761) applies to hydraulic fracturing and any other well stimulation treatment designed to enhance the permeability of the oil-bearing formation. Well stimulation treatments under SB 4 include, but are not limited to, hydraulic fracturing treatments and acid well stimulation treatments. Well stimulation treatments do not include steam flooding, water flooding, or cyclic steaming. Additionally, such treatments do not include routine well cleanout work, routine well maintenance, routine removal of formation damage due to drilling, bottom hole pressure surveys, or routine activities that do not affect the integrity of the well or the formation. SB 4 (14 CCR Section 1783.1) also requires operators Spill Contingency Plan to identify where handling of well stimulation fluid and additives has been addressed.

14 CCR 1786 requires storage and handling of well stimulation fluids to be covered in those already prepared and approved plans, SB 4 rules and EIR mitigation measures.

The California SB 4 rules regulate the storage and containment of well stimulation treatment chemicals at the well site. Recovered fluids must be stored in containers and does not allow the fluids to be stored in sumps or pits. SB 4 also requires secondary containment for any production facilities in place for 30 days or more and a Spill Contingency Plan to be implemented immediately in the event of an unauthorized release. These measures would reduce the likelihood of contamination of surface waters.

California SB 4 (14 CCR Section 1788) requires, among other public disclosures, a complete list of the chemicals and the maximum concentration of each chemical constituent of the well stimulation fluids used, so that a complete health study can be conducted. Additionally, SB 4 requires trade secret information be publicly disclosed with limited exception. Furthermore, operators are required to sample, analyze and submit the analysis to the DOGGR for all recovered fluid.

Drilling, field development and production activities associated with oil and gas exploration and development require use of a variety of chemicals and other materials, some of which would, if released to surface waters, be a source of contamination. These include drilling muds and additives which contain various contaminants such as salts, acids, mercury, cadmium, arsenic, and hydrocarbons, among others, which, if not managed correctly could, through runoff, affect surface water quality. Potential impacts of these contaminants include human contact, inhalation or ingestion and the effects of exposure, spills, or accidental fires on surface water resources. Operators of well stimulation treatments would be required to file information to DOGGR as required by SB 4.

The SB 4 Final EIR (DOGGR, 2015a) includes several measures to mitigate adverse effects on surface water quality including Mitigation Measure SWR-1a (Require Stormwater Pollution Prevention Plan for all), Mitigation Measure SWR-1b (Provide Adequate Flood Protection), and Mitigation Measure SWR-1c (Protect Surface Water Reservoirs). Collectively, the DOGGR regulations and these mitigation measures provided in the Final EIR, serve to reduce potential impacts to surface water quality. The regulations are applicable to all alternatives associated with the RMPA/EIS. Coupled with implementation of Central Coast BMPs and SOPs, no additional mitigation is required.

Sediment and Erosion

Erosion and siltation impacts could occur primarily through ground disturbance associated with construction of new oil and gas well pads, access roads, transmission lines, pipelines, and other infrastructure. Construction of 37 wells would disturb up to 206 acres of land, including access roads, causing potential exposure to erosion or transport off site and into surface waters, or, in the case of construction in or near streams, flow encroachments and alterations that could increase the potential or frequency of in-stream erosion. Erosion effects would be variable depending on terrain, with higher erosive potential in areas of steep terrain.

BLM rules for onshore oil and gas operations (Section 3.8.2) require operators to exercise care and diligence to avoid damage to surface or subsurface resources, which include soils that may be subject to erosion. Relevant Central Coast BMPs and SOPs require:

- Unused or unnecessary areas are to be recontoured and revegetated to reduce fugitive dust emissions from bare or eroded soils, which would reduce soil erosion impacts.
- Soil disturbance is to be limited by limiting developments to the smallest area possible and by using previously disturbed areas and existing roads to the extent practicable.
- Surface disturbance is to be minimized and disturbed areas on steep slopes designed to prevent surface water from concentrating to reduce erosion and sedimentation.

- Access is to be restricted and authorized projects suspended during wet weather when soil resources will be detrimentally affected by rutting, compaction, and increased erosion.
- Operators are to follow guidelines for site reclamation in the Oil and Gas BMP section to protect soils, including topsoil conservation, scarifying or disking soil, recontouring the area, redistributing topsoil and providing ground cover through seeding or other methods.
- No soil should be imported from off-site to limit introduction of weeds.
- Erosion and sediment control measures such as mulching, placement of certified weed free hay bales and other drainage control features, construction of rolling dips, and seasonal limits on operations reduce or eliminate erosion and sediment transport or incidental sediment discharge.
- Road construction/reconstruction is to be conducted so as to reduce sediment generation and delivery. This can be accomplished by, among other means, following designs for road systems, incorporating adequate drainage structures, properly installing stream crossings, avoiding road construction in streamside management areas, removing debris from streams, and stabilizing areas of disturbed soil such as road fills.
- Roads are to be managed to prevent sedimentation, minimize erosion, maintain stability, and reduce the risk that drainage structures and stream crossings will fail or become less effective. Components of this measure include inspections and maintenance actions to prevent erosion of road surfaces and to ensure the effectiveness of stream-crossing structures.
- Runoff is to be confined onsite to reduce impacts of mechanical site preparation and revegetation operations, particularly in areas that have steep slopes or highly erodible soils, or where the site is located in close proximity to a water body.
- Areas disturbed during road construction are to be revegetated rapidly, in particular where mineral soil is exposed or agitated.
- Construction activities that disturb one or more acres of soil or less than one acre but are part of a larger common plan of development or sale having the potential to disturb one or more acres (includes clearing, grading, and ground disturbances such as stockpiling or excavation) are required to obtain coverage under the General Permit for Discharges of Stormwater Associated with Construction Activity (General Construction Storm Water Permit), Order 2009-0009-DWQ) and manage construction in accordance with permit requirements.
- Prevent damage and initiate repair soils subject to water erosion.
- Roads, well pads, and facilities for exploratory wells are to be designed to impact and fragment the least acreage practicable. New facilities must be designed to maintain natural drainage and runoff patterns. Noncommercial wells are to be restored as soon as appropriate using BLM restoration methods.
- Natural contours and overland flow patterns should be maintained to the maximum extent possible. Channelization or diversion of natural flows should be avoided to the maximum extent practical.

State of California regulations, administered by the SWRCB and DOGGR and described in Section 3.8.2, include measures for erosion protection during construction by requiring Stormwater Pollution Prevention Plans for construction, and restoration of well sites after abandonment. The Clean Water Act Sections 401 and 404, and Sections 1600–1616 of the California Fish and Game Code, provide additional protection by requiring avoidance and minimization of impacts to surface waters, and mitigation for impacts that are unavoidable.

Stream erosion has the potential to impact water quality if the erosion results in oil production pipeline breaks or other damage to storage areas or equipment that could result in spills (Section 4.4, Hazardous Materials and Public Safety).

The SB 4 Final EIR (DOGGR, 2015a) includes Mitigation Measure SWR-2a (Implement Erosion Control Plan) which would require the development and implementation of an erosion-control plan that would mitigate adverse effects related to sediment and erosion. Collectively, the Central Coast BMPs and SOPs, DOGGR regulations and Mitigation Measure SWR-2a serve to reduce potential impacts to surface water resources for all alternatives. No additional mitigation is required.

Flooding

Oil well development has the potential to induce flood hazards, either to adjacent property by obstruction of flood flows or by increasing flood peaks and volumes through clearing and grading for new wells, access roads and other infrastructure. Overall, flood hazard impacts are expected to be minimal for all alternatives. Most of the Federal mineral estate lands are outside of designated floodplains. Some of the well structures, pads and other infrastructure may be located in areas of local flooding, but few new permanent structures would be involved, and the wells, pipelines and other equipment that may be on the sites and be inundated are not generally subject to high damage if flooded. Flow diversions from well pad construction or increased flood peaks with clearing and grading would be minor and local due to the small size of the well pads and other infrastructure.

Flooding has the potential to impact water quality if the flooding overflows contaminated areas, or sumps, or results in pipeline breaks and spills of contained material (Section 4.4, Hazardous Materials and Public Safety).

The SB 4 Final EIR (DOGGR, 2015a) includes Mitigation Measure SWR-1b (Provide Adequate Flood Protection) would require that all sites be protected from 100-year flooding, which would reduce the potential for flood impacts and contamination of surface waters through flooding of sites. No additional mitigation is required.

Water Use and Supply

Construction of new oil wells requires water mainly for drilling and construction dust control, and can be up to 0.39 to 0.77 acre-feet per well for conventional well drilling operations (See Table 4.7-1). Total water use under the RFD scenario would be approximately 12.5 to 24.6 acre-feet for conventional well drilling, not including any additional water that may be used for well stimulation. Exploratory well drilling operations would potentially use more water, between 5 to 10 acre-feet per well. In the event of well stimulation, water use could be an additional 0.4 acre-feet for each well (Table 4.7-1). Water intensive well stimulation treatments could use additional water, up to 10 to 20 acre-feet per well. Water for well drilling and stimulation could be from surface water sources or groundwater provided the appropriate rights to the water can be obtained. Due to the cost and difficulty of obtaining the rights to remove surface water from streams (Federal reserved water rights or BLM appropriative water rights may apply), water is typically is purchased from a local supplier and would likely come from groundwater or surface water imported from outside the area.

Total water use is estimated for two RFD scenarios (See Section 4.7.2). RFD Scenario 1 assumes that all 37 wells would be conventional vertical wells with well stimulation treatments involving one to three stages. For RFD Scenario 2, all 37 wells are assumed to be water intensive horizontal wells with well stimulation treatments involving up to 20 stages. Total water use is estimated at 29.2 to 43.3 acre-feet for RFD Scenario 1, and 555 to 1,100 acre-feet for RFD Scenario 2. Assuming a 20-year development period, total water use would range from 1.5 to 55.5 acre-feet per year for the 37-well RFD Scenario, and 1.5 to 48 acre-feet per year for the 32 wells in Alternative B.

Local short-term surface water stresses in the form of decreases in river flow could occur from groundwater pumping for the RFD Scenario. These impacts would require a site-specific analysis to evaluate. In a regional context of overall water use and supply, a total water use of 1.5 to 55.5 acre-feet per year represents

only a small fraction of annual water use in the area and is unlikely to have a noticeable effect on regional water use. The Salinas Valley alone annually uses approximately 8,500 to 317,000 times the expected annual water use by the 37 wells in the RFD Scenario (MCWRA, 2006). This issue, as it relates to groundwater use, is discussed further in Section 4.7.2 of this report.

In the unlikely event direct diversion from local surface sources is used as a water supply, the use of the water should already be reflected in water planning and environmental restoration efforts undertaken by the State Water Resources Control Board and other regional and local entities. The use would also be subject to State water law principles requiring all water users to limit their water use to what is reasonable, beneficial, and not wasteful and, in the case of a new appropriative right, subject to water availability (DOC, 2015). Most surface water used by suppliers in the area of the Federal mineral estate is imported from other areas, so it is unlikely any direct use impact would occur to surface waters within the CCFO Planning Area.

California SB 4 rules require that the source and location of water supply be disclosed as part of a water management plan and as part of post-treatment public disclosures. The SB 4 Final EIR (DOGGR, 2015a) includes Mitigation Measure SWR-3a (Ensure Adequate Water Availability) which would the mitigate the effects of water use. SWR-3a would require disclosure of the quantity of water to be used, and the source and specific supplier(s) of the water, along with assurance that the intended amount of water would be available and that there are sufficient supplies to serve throughout the duration of the project without curtailing or otherwise adversely affecting other existing water users, and without the need for new or expanded water entitlements or treatment facilities.

There is a potential for local groundwater extraction for the purpose of well construction or stimulation to temporarily affect the amount of water in nearby streams, resulting in stress to the riparian environment. The SB 4 Final EIR (DOGGR, 2015a) includes Mitigation Measure GW-1b (Minimize Groundwater Impacts) which would require a groundwater evaluation that would include an assessment of potential depletions of surface water that may have significant and unreasonable adverse impacts on beneficial uses of the surface water. The application may be denied if such an effect is found to occur, or the applicant may be required to use recycled water, saline water, produced water, or other water sources.

Aquatic Intactness

For oil and gas development, the primary impacts to aquatic intactness are similar to those previously described for water quality, sediment and erosion, and water use. Thus, impacts from decreased water quality, and increase of sedimentation or erosion, or additional water use generally will cause a decline in aquatic intactness. Additional impacts from oil and gas development are varied and if present would generally result from well drilling activities as opposed to well operation or well stimulation. The removal of shading vegetation can cause an increase to stream temperature. Although unlikely due to regulation under CWA Section 404 and the State's Lake and Streambed Alteration Program, unmitigated structures placed in streams can create barriers for aquatic species passage.

4.8.3 Impacts of Alternative A (No Action)

Under Alternative A, all Federal mineral estate lands currently open for exploration would remain open to oil and gas leasing and lands currently closed would remain closed. Up to 37 wells would be developed under the RFD Scenario.

Stipulations and management actions under the 2007 HFO RMP (BLM, 2007; Appendix D) would apply to the open areas. Relevant to surface waters and the general impacts described in Section 4.8.2, these stipulations require reasonable measures to protect water resources, minimization of surface disturbances and effects on water resources, reclamation of lease sites, and, on slopes that exceed 10% within the selenium-bearing Moreno shale, the design of slope-failure measures, protective measures for off-site

sediment transport, and reclamation and revegetation measures must be prepared by a licensed professional engineer. Oil sump construction and storage of oil in oil-well cellars is not permitted in floodplains.

Under Alternative A, lands outside of existing oil fields would be open for exploration and exploitation. Most of this land is now in a natural, undisturbed condition. Therefore, the impacts described below could occur in previously undisturbed areas.

Appendices C and D provides a list of the Central Coast Oil and Gas BMPs, SOPs and Stipulations that would help reduce the effects to surface water resources. Additionally, all the mitigation measures from the DOGGR Final EIR discussed in Section 4.8.2 are applicable to Alternative A. No additional mitigation measures are necessary to mitigate impacts associated with this alternative. Collectively, the DOGGR SB 4 permanent regulations, and the mitigation measures in the DOGGR Final EIR (DOC, 2015) mitigate the potential impacts to surface water in the CCFO Planning Area.

Surface Water Quality

Water quality impacts are as described in Section 4.8.2, with the potential for these impacts to occur anywhere within the lands that would be open to oil exploration and production. All of the watersheds shown in Figure 3.8-1, except San Pablo Bay, could potentially be affected. The location of Federal mineral estate is such that the Salinas, Pajaro, Upper Los Gatos–Avenal, Panoche–San Luis Reservoir and, to a lesser extent, the San Francisco Bay and Coyote watersheds, may be affected by downstream transport of water quality contaminants. Major rivers and reservoirs include the Salinas River and tributaries, the San Benito/Pajaro Rivers and tributaries, the Panoche and other streams entering the Central Valley, Lake San Antonio, Hernandez Reservoir, and San Luis Reservoir.

Several of the downstream waterbodies are impaired, but, with the exception of sedimentation/siltation, for reasons unrelated to the oil industry. Although there is a potential for transport of spilled materials to reach downstream waters and reservoirs, there is little potential for substantial contamination or alteration of beneficial uses or exacerbation of existing impairments for the reasons that, based on past spill records, spills in the RFD Scenario are expected to be rare and of insufficient volume to travel the long distances to downstream surface waters. (See Section 4.4, Hazardous Materials and Public Safety.) Existing regulations require immediate containment and clean-up, further reducing the potential for downstream contamination. Most water quality impacts would occur in the minor streams in the hilly terrain of the Federal mineral estate.

Sediment and Erosion

Sediment and erosion impacts are as described in Section 4.8.2, with the potential for these impacts to occur anywhere within the open lands. All the watersheds shown in Figure 3.8-1, except San Pablo Bay, could potentially be affected.

The same downstream waters described above for Water Quality could potentially be affected by sediment disturbed from construction of well pads and access roads and transported downstream by stream flows. The total amount of sediment transported downstream would be minor due to the small area anticipated to be developed under the RFD Scenario. Roughly 206 acres would be disturbed, in comparison to 4.9 million acres for the Salinas, Pajaro, Upper Los Gatos–Avenal, Panoche–San Luis Reservoir, San Francisco Bay, and Coyote watersheds, which all include Federal mineral estate. Sedimentation/siltation and turbidity are listed contaminants for impairment of several streams in the area, including the San Benito River, Panoche River, Salinas River, Pajaro River, and Pacheco Creek (RWQCB, 2015), and any increase in sediment transport from the watersheds could contribute to the impairment.

Flooding

The characterization of flood impacts described in Section 4.8.2 applies to Alternative A. There are few designated floodplains within the open area of Alternative A. Impacts would be localized and on small watercourses in remote areas and mostly involve structures that are not prone to high flood damage.

Water Use and Supply

Water supply impacts of Alternative A are as described in Section 4.8.2.

Aquatic Intactness

Aquatic Intactness impacts of Alternative A are as described in Section 4.8.2 and could impact all the HUC12 subwatersheds with the highest aquatic intactness scores as depicted in Figure 3.8-1 and listed in Section 3.8.4.

Leases Subject to Settlement Agreement – Subalternative 1

The 14 non-NSO leases as identified in Hollister I and Hollister II would be issued.

Surface Water Quality. Water quality impacts are the same as those described for Alternative A in general, with the exception that potential impacts are mainly limited to the Salinas River watershed, including Lake San Antonio, and the Panoche River watershed by development of all 14 leases. The Upper Los Gatos–Avenal and Pajaro watersheds could be affected to a minor extent by Leases CACA 053833 and 053834 and by Lease CACA 053831, respectively.

Sediment and Erosion. Sediment and erosion impacts are as described overall for Alternative A in general, with the potential for these impacts limited to the Salinas Watershed (Leases CACA 052959, 052960, 053824, 053825, 053826, and 053827) and the Panoche–San Luis Reservoir Watershed (Leases CACA 053828, 053829, 053830, 053831, 053832, 053833, 053834, and 053835), and to a lesser extent the Upper Los Gatos–Avenal (Leases CACA 053833 and 053834) and Pajaro (Lease CACA 053831) watersheds.

Flooding. The characterization of flood impacts described in Section 4.8.2 and for Alternative A in general applies to the leases. There are no designated floodplains within the area of the leases.

Water Use and Supply. Water supply impacts of the leases are the same as described in Section 4.8.2 and for Alternative A in general.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impact would occur.

4.8.4 Impacts of Alternative B

Under Alternative B, the RFD scenario would be limited to mineral estate lands within existing oil and gas fields, plus a half-mile buffer, for a total of 39,000 open acres. Because it would be limited to existing oil and gas field, there would be up to 32 wells and 179 acres of disturbance. The wildcat wells would not occur under this alternative. The alternative would be subject to stipulations and standard operating procedures that would be consistent with the management goals of the 2007 HFO RMP.

Appendix C provides a list of the Central Coast Oil and Gas Stipulations that would help reduce the effects to groundwater resources. Additionally, all the mitigation measures from the DOGGR Final EIR discussed in Section 4.8.2 are applicable to Alternative B. No additional mitigation measures are necessary to mitigate impacts associated with this alternative. Collectively, the DOGGR SB 4 permanent regulations, and the

mitigation measures in the DOGGR Final EIR (DOC, 2015) mitigate the potential impacts to surface water in the CCFO Planning Area.

Surface Water Quality

Water quality impacts are as described in Section 4.8.2, with the potential for these impacts limited to the open lands in existing oil fields, plus any downstream waters impacted by stream transport of contaminants. Based on the location of open lands, the Panoche–San Luis Reservoir, Upper Los Gatos–Avenal, and Tulare–Buena Vista Lakes watersheds would receive the majority of impacts, with a lesser potential for impacts in the Salinas, Pajaro San Francisco Coastal South, San Joaquin Delta, and Suisan Bay watersheds. All the other watersheds shown in Figure 3.8-1 would be unaffected. Subject to these limitations in area, the Alternative B impacts are as described for Alternative A.

Sediment and Erosion

Sediment and erosion impacts are as described in Section 4.8.2, with the potential for these impacts to occur limited to existing oil fields. Watersheds potentially affected are described under Water Quality above. Subject to these limitations in area, the Alternative B impacts are as described for Alternative A.

Flooding

The characterization of flood impacts described in Section 4.8.2 applies to Alternative B. There are few designated floodplains within the open area of Alternative B. Impacts would be localized and on small watercourses in remote areas and mostly involve structures that are not prone to high flood damage.

Water Use and Supply

Water supply impacts of Alternative B are as described in Section 4.8.2.

Aquatic Intactness

Aquatic Intactness for the HUC12 subwatersheds with the highest aquatic intactness scores as depicted in Figure 3.8-1 and listed in Section 3.8.4 would not be affected.

Leases Subject to Settlement Agreement

Surface Water Quality. Water quality impacts are the same as those described for Alternative B in general, with the exception that all potential impacts would be restricted to the Panoche–San Luis Reservoir Watershed (Leases CACA 053828, 053829, 053830, 053831, 053832, 053833, 053834, and 053835), and a very small portion (about 220 acres) of the Upper Los Gatos–Avenal Watershed (Leases CACA 053833 and 053834) and the Pajaro Watershed (Lease CACA 053831).

Sediment and Erosion. Sediment and erosion impacts are as described overall for Alternative B in general, with the potential for these impacts limited to the Panoche–San Luis Reservoir Watershed (Leases CACA 053828, 053829, 053830, 053831, 053832, 053833, 053834, and 053835), and to a lesser extent the Upper Los Gatos–Avenal (Leases CACA 053833 and 053834) and Pajaro (Lease CACA 053831) watersheds.

Flooding. The characterization of flood impacts described in Section 4.8.2 and for Alternative B in general applies to the leases. There are no designated floodplains within the area of the leases.

Water Use and Supply. Water supply impacts of the leases are the same as described for Alternative B in general.

4.8.5 Impacts of Alternative C

Under Alternative C, the RFD Scenario would be limited to high oil and gas occurrence potential areas or within the boundaries of oil and gas fields, plus a half-mile buffer with the exception of core

population areas of the kangaroo rat in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills which are closed to leasing. Up to 37 wells would be developed under the RFD Scenario. Controlled Surface Use stipulations would apply to the open areas. The alternative would be subject to stipulations and standard operating procedures that would be consistent with the management goals of the 2007 HFO RMP.

Appendix C provides a list of the Central Coast Oil and Gas Stipulations that would help reduce the effects to groundwater resources. Additionally, all the mitigation measures from the DOGGR Final EIR discussed in Section 4.8.2 are applicable to Alternative C. No additional mitigation measures are necessary to mitigate impacts associated with this alternative. Collectively, the DOGGR SB 4 permanent regulations, and the mitigation measures in the DOGGR Final EIR (DOC, 2015) mitigate the potential impacts to surface water in the CCFO Planning Area.

Surface Water Quality

Water quality impacts are as described in Section 4.8.2, and essentially the same as for Alternative A, for the Estrella, Middle San Joaquin–Lower Chowchilla, Pajaro, Panoche–San Luis Reservoir, Salinas, Suisun Bay, Tulare–Buena Vista Lakes, and Upper Los Gatos–Avenal watersheds. There would be no impacts on the other watersheds shown in Figure 3.8-1. Although within the impacted watersheds the area open to exploration is reduced from that of Alternative A, the RFD Scenario is the same, and general impacts are expected to be the same, but limited to a reduced area. Subject to these limitations in area, the Alternative C impacts are as described for Alternative A.

Sediment and Erosion

Sediment and erosion impacts are as described in Section 4.8.2. Watersheds potentially affected are described under Water Quality above. Subject to these limitations in area, the Alternative C impacts are as described for Alternative A.

Flooding

The characterization of flood impacts described in Section 4.8.2 applies to Alternative C. Impacts would be localized and mostly on small watercourses in remote areas and mostly involve structures that are not prone to high flood damage.

Water Use and Supply

Water supply impacts of Alternative C are as described in Section 4.8.2.

Aquatic Intactness

Aquatic Intactness impacts of Alternative C are as described in Section 4.8.2 and of the HUC12 subwatersheds with the highest aquatic intactness scores as depicted in Figure 3.8-1 and listed in Section 3.8.4, only the Upper Cantua Creek subwatershed could be impacted.

Leases Subject to Settlement Agreement

Impacts for the leases subject to the settlement agreement are the same as described for Alternative A, Subalternative 1; including for water quality, sediment and erosion, flooding, and water supply. Although the area available for surface occupancy under Alternative C is slightly less than for Alternative A, the RFD Scenario is the same.

4.8.6 Impacts of Alternative D

Under Alternative D, Federal mineral estate underlying BLM surface estate would be open. Split estate lands would be closed. The Ciervo-Panoche Natural Area would also be closed. Areas closed under the

2007 RMP would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, and Fort Ord National Monument). Controlled Surface Use stipulations would apply. The alternative would be subject to stipulations and standard operating procedures that would be consistent with the management goals of the 2007 HFO RMP. Up to 37 wells would be developed under the RFD Scenario.

Appendix C provides a list of the Central Coast Oil and Gas Stipulations that would help reduce the effects to groundwater resources. Additionally, all the mitigation measures from the DOGGR Final EIR discussed in Section 4.8.2 are applicable to Alternative D. No additional mitigation measures are necessary to mitigate impacts associated with this alternative. Collectively, the DOGGR SB 4 permanent regulations, and the mitigation measures in the DOGGR Final EIR (DOC, 2015) mitigate the potential impacts to surface water in the CCFO Planning Area.

Surface Water Quality

Water quality impacts are as described in Section 4.8.2, and as described for Alternative A, but limited to an area of 118,100 acres in the Estrella, Pajaro, Panoche–San Luis Reservoir, Salinas, Upper Los Gatos–Avenal, Middle San Joaquin/Lower Chowchilla, Alisal–Elkhorn Slough, Coyote, and Carmel watersheds. There would be no impacts on the other watersheds shown in Figure 3.8-1. Due to the location of the open lands, most of the impacts would occur in the Upper Los Gatos–Avenal, Panoche–San Luis Reservoir, and Pajaro watersheds. Downstream waters potentially affected include the San Benito/Pajaro Rivers, including Hernandez Reservoir, and the Panoche River. The San Luis Reservoir would not be affected.

Sediment and Erosion

Sediment and erosion impacts are as described in Section 4.8.2, with the potential for these impacts limited to 151,400 acres in the Estrella, Pajaro, Panoche–San Luis Reservoir, Salinas, Upper Los Gatos–Avenal, Middle San Joaquin/Lower Chowchilla, Alisal–Elkhorn Slough, and Carmel watersheds

Flooding

The characterization of flood impacts described in Section 4.8.2 applies to Alternative D. Impacts would be localized and mostly on small watercourses in remote areas and mostly involve structures that are not prone to high flood damage.

Water Use and Supply

Water supply impacts of Alternative D are as described in Section 4.8.2.

Aquatic Intactness

Aquatic Intactness impacts of Alternative D are as described in Section 4.8.2 and of the HUC12 sub-watersheds with the highest aquatic intactness scores as depicted in Figure 3.8-1 and listed in Section 3.8.4, only the Upper Cantua Creek and Robinson Creek–South Fork Orestimba Creek subwatersheds could be impacted.

Leases Subject to Settlement Agreement

Basic impacts for the leases subject to the settlement agreement are the same as described for Alternative A, Subalternative 1, including for water quality, sediment and erosion, flooding, and water supply, but due to much of the lease area being closed, the area on which these impacts could occur is much reduced.

4.8.7 Impacts of Alternative E

Under Alternative E, Federal mineral estate outside California DWR Bulletin 118 groundwater basins and sub-basins would be open, while Federal mineral estate within these basins would be closed. Areas closed

under the 2007 RMP would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, and Fort Ord National Monument). All lands open to leasing would have CSU stipulations. NSO stipulations would be applicable within 12-digit Hydrologic Unit Codes intersecting EPA impaired, perennial surface waters; 12-digit Hydrologic Unit Codes intersecting non-impaired, perennial surface waters that intersect split estate; 12-digit HUC subwatersheds with the highest aquatic intactness score; within 0.25 miles of non-impaired, perennial surface waters; and, within 0.25 miles of eligible Wild & Scenic Rivers. The alternative would be subject to additional stipulations and standard operating procedures that would be consistent with the management goals of the 2007 HFO RMP. Up to 37 wells would be developed under the RFD Scenario.

Appendix C provides a list of the Central Coast Oil and Gas Stipulations that would help reduce the effects to groundwater resources. Additionally, all the mitigation measures from the DOGGR Final EIR discussed in Section 4.8.2 are applicable to Alternative E. No additional mitigation measures are necessary to mitigate impacts associated with this alternative. Collectively, the DOGGR SB 4 permanent regulations, and the mitigation measures in the DOGGR Final EIR (DOC, 2015) mitigate the potential impacts to surface water in the CCFO Planning Area.

Surface Water Quality

Water quality impacts are as described in Section 4.8.2, and as described for Alternative A, but limited to a smaller area. All watersheds shown in Figure 3.8-1 would be potentially affected except the Middle San Joaquin–Lower Chowchilla, Middle San Joaquin–Lower Merced–Lower Stanislaus, San Pablo Bay, San Francisco Coast South, San Lorenzo–Soquel, and Coyote watersheds. The NSO stipulations for hydrologic units intersecting impaired certain non-impaired waters, hydrologic units with the highest aquatic intactness, and within 0.25 miles of non-impaired perennial surface waters and eligible Wild & Scenic Rivers would reduce, but not completely eliminate, the potential for additional contamination of those waters by increasing the distance pollutants would have to travel to reach surface waters, and increasing the response time for spill detection, control and clean-up.

Sediment and Erosion

Sediment and erosion impacts are as described in Section 4.8.2, with the potential for these impacts limited as described under Water Quality above.

Flooding

Alternative E flood impacts are as described in Section 4.8.2, but limited to the open areas for this alternative. Impacts would be localized and mostly on small watercourses in remote areas and mostly involve structures that are not prone to high flood damage.

Water Use and Supply

Water supply impacts of Alternative E are as described in Section 4.8.2.

Aquatic Intactness

Aquatic Intactness for the HUC12 subwatersheds with the highest aquatic intactness scores as depicted in Figure 3.8-1 and listed in Section 3.8.4 would not be affected.

Leases Subject to Settlement Agreement

Under Alternative E, the portions of the leases subject to the settlement agreement that do not intersect groundwater basins are open to oil and gas leasing. Basic impacts for the leases subject to the settlement agreement are the same as described for Alternative A, including for water quality, sediment and erosion, flooding, and water supply, but reduced in area due to only approximately 10,000 acres being open without NSO stipulations, compared to 17,600 in Alternative A.

4.8.8 Impacts of Alternative F

Under Alternative F (Figure 2-6 in Appendix A), unless currently closed under the 2007 Hollister Field Office RMP, Federal mineral estate would be open with CSU stipulations and/or subject to NSO. Approximately 683,100 acres of BLM oil and gas Federal mineral estate would be open to oil and gas leasing with CSU stipulation(s), 67,500 acres would be closed to leasing, and 42,400 acres would be subject to NSO stipulations. CSU stipulations would be applicable to all public lands open to mineral leasing. All the mitigation measures from the DOGGR Final EIR discussed in Section 4.8.2 would be applicable to Alternative F. No additional mitigation measures are necessary to mitigate impacts associated with this alternative. Collectively, the DOGGR SB 4 permanent regulations, and the mitigation measures in the DOGGR Final EIR (DOC, 2015) mitigate the potential impacts to surface water in the CCFO Planning Area.

Surface Water Quality

Water quality impacts would be as described in Section 4.8.2, and as described for Alternative A. All watersheds shown in Figure 3.8-1 would be potentially affected except the San Pablo Bay watershed. NSO lands would slightly increase (700 acres) compared to those under Alternative A. This difference would be offset by a decrease on open areas of the same amount. Since NSO areas could be utilized from adjacent land, which would be in the same watersheds, surface water quality impacts are in effect identical to those described under Alternative A.

Sediment and Erosion

Potential sediment and erosion impacts would be as described in Section 4.8.2, with slight differences in NSO and open areas as described above under Surface Water Quality.

Flooding

Alternative E flood impacts are as described in Section 4.8.2, but limited to the open areas which would be slightly reduced (0.1 percent reduction) over Alternative A. In effect this impact is identical to Alternative A.

Water Use and Supply

Water supply impacts would be the same as described in Section 4.8.2.

Aquatic Intactness

Aquatic Intactness impacts would be the same as described for Alternative A.

Leases Subject to Settlement Agreement

Impacts to leases subject to settlement agreement are as described for Alternative A, Subalternative 1, including for water quality, sediment and erosion, flooding, and water supply.

4.9 Soil Resources

This section addresses the U.S. Bureau of Land Management's (BLM's) Best Management Practices (BMPs) and Standard Operating Procedures for proper management of soil resources and describes the types of impacts. Protection of soil resources involves controlling erosion and sediment transport, maintaining vegetation cover, and protecting biological and physical characteristics of soils.

4.9.1 Introduction

The management goal for soil resources established by the 2007 HFO RMP is to manage soil on BLM surface lands such that functional biological and physical characteristics that are appropriate to soil type, climate, and land form are exhibited (Rangeland Health Standards and Guidelines, 2000).

To achieve this goal, the 2007 HFO RMP established the following objectives:

- Control erosion and sediment transport;
- Maintain vegetation cover at or above the level necessary to stabilize soils; and
- Protect and restore biological soil crusts on watersheds.

The 2007 HFO RMP includes the following Area-wide Management Actions to protect soil resources as follows:

- **SOIL-COM1.** Require an approved erosion control strategy and topsoil segregation/restoration plan for surface disturbance on slopes of 20 to 40 percent. Such construction must be properly surveyed and designed by a certified engineer and approved by the BLM before construction and maintenance. No surface disturbance on slopes greater than 40 percent unless it is determined that it would cause a greater impact to pursue other alternatives.
- **SOIL-COM2.** Require a topsoil segregation/restoration plan be submitted to and approved by the BLM before construction and maintenance actions that would disturb the surface of soils considered to have poor topsoil suitability or restoration potential.
- **SOIL-COM3.** Close roads and trails to public use during periods of extreme wet weather in areas where sustained public use may compromise the integrity of the road or trail surface.
- **SOIL-COM4.** Implement soil loss assessment procedures for road and trail maintenance.
- **SOIL-COM5.** Implement best management practices (BMPs) for non-point source pollution control.

BLM Best Management Practices/Standard Operating Procedures for soil resources (see Appendix D) would reduce soil disturbance, restrict access during wet weather, and require site reclamation at oil and gas sites.

Additional BMPs to control stormwater runoff and erosion would be required under the Clean Water Act (CWA) National Pollutant Discharge Elimination System (NPDES) Construction General Permit. Please see Section 3.9.2 and Appendix J (Regulatory Framework) for a description of CWA requirements.

BLM is unable to quantify impacts to soil resources from the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.9. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects to soil resources from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual,

direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground. Other incomplete or unavailable information includes the type(s) of development(s) and site-specific resource conditions because it's impossible for BLM to know how, where, or when leases would be developed.

For example, BLM is unable to quantify increased soil loss and/or erosion under the range of alternatives because the timing, intensity, and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is based on current resource conditions described in Section 3.9, and the regulatory framework for oil and gas activities described in Appendix J.

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of federal minerals in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99 percent of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. The CCST report also indicates the majority of oil and gas activity in the planning area entails conventional well drilling. The CCST report suggests the potential for future operations to include enhanced well stimulation techniques is low because previous attempts to extract resources using hydraulic fracturing have not been productive or economical. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects of future leasing and development on resources in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

4.9.2 Impacts Common to All Alternatives

The RFD Scenario (i.e., between zero and 37 development wells with up to approximately 206 acres of surface disturbance over the next 15 to 20 years on Federal mineral estate in the Planning Area) would occur under all of the alternatives except Alternative B (between zero and 32 development wells with up to approximately 179 acres of surface disturbance). This would require construction of access roads, drill pads, and pipelines and other oil field facilities, as each are included as part of the surface disturbance.

In general, regardless of erosion potential, all soils become erodible when disturbed and the drilling of new wells would cause ground disturbance. Grading for access roads and drill pads would cause ground disturbance that could result in soil erosion. Drilling of new oil and gas wells and geophysical surveys would create loose soil or compacted soil that leads to increased runoff and erosion. Soil erosion could lead to sedimentation of local surface waters or increased flooding. Soil erosion at oil well sites may also transport chemical contamination (caused by accidental releases) to waterways or decrease soil fertility at the spill site or deposition site.

The soil resource Management Actions established with the 2007 RMP require approved erosion control strategies and topsoil segregation/restoration plans for activities on slopes ranging from 20 to 40 percent, and no soil disturbance activities are allowed on slopes greater than 40 percent. The existing management actions would prohibit high-impact activities in sensitive areas and promote restorative measures that would minimize or avoid impacts (BLM, 2007).

Implementation of the BLM BMPs developed to protect soil resources (Appendix D, Section 1.5) will reduce soil disturbance, restrict access during wet weather, and require site reclamation at oil and gas sites. The soil protective BMPs include:

- Minimize soil disturbance by limiting developments to the smallest area possible and by using previously disturbed areas and existing roads to the extent practicable.
- Minimize surface disturbance and design disturbed areas on steep slopes to prevent surface water from concentrating to reduce erosion and sedimentation.

- Restrict access and suspend authorized projects during wet weather when soil resources will be detrimentally affected by rutting, compaction, and increased erosion.
- Minimize fire control lines, including both handline and dozerline, to the width necessary to effectively stop fire spread. Rehabilitate lines by smoothing out berms and installing waterbars prior to the rainy season.
- Assess the need for soil stabilization following wildfires. Use the Emergency Stabilization and Rehabilitation process to determine and implement needed actions.
- Follow guidelines for site reclamation in the Oil and Gas BMP section to protect soils, including topsoil conservation, scarifying or disking soil, recontouring the area, redistributing topsoil and providing ground cover through seeding or other methods. No soil should be imported from off-site to limit introduction of weeds.
- Actively patrol public lands to prevent unauthorized off-road travel. If unauthorized routes are found, block access to minimize further soil disturbance and reduce the potential for erosion through rehabilitation action.

Additionally, BMPs for Water Resources Protection (Appendix D, Section 1.6.1) include:

- Design roads, well pads, and facilities for exploratory wells to impact and fragment the least acreage practicable. New facilities shall be designed to maintain natural drainage and runoff patterns. Noncommercial wells shall be restored as soon as appropriate using BLM restoration methods.
- Prevent and repair soils subject to water erosion.
- Timely plugging and abandonment of depleted wells will be required. This includes plugging the well bore with cement, removing all materials and equipment, and recontouring/revegetation as specified in the conditions of approval.

The BLM Oil and Gas Standard Operating Procedures (SOPs) specifically require surface reclamation, interim and final (Appendix D, Section 1.8.8) for any petroleum exploration and development. Reclamation is required for any disturbed surface that is not necessary for continued production operations. The site reclamation guidelines address general operations, producing well sites, non-producing wells, and final reclamation (Appendix D).

4.9.3 Impacts of Alternative A (No Action)

Alternative A would utilize the 2015 RFD Scenario while continuing current management under the existing 2007 HFO RMP (BLM, 2007). Drilling up to 37 new oil and gas wells would require grading and ground disturbance that would result in soil erosion in the absence of mitigation. Mitigation Measures S-1 (Prepare and Submit SWPPP) and S-2 (Prepare and Submit Reclamation Plan) (see full text in Appendix C) would apply to Alternative A.

Leases Subject to Settlement Agreement – Subalternative 1

The 14 non-NSO leases as identified in Hollister I and Hollister II would be issued. These leases are located in areas with sparse vegetation and erodible soils described in Section 3.9.4. Well drilling, well stimulation, and possibly field development of these leases in the future would lead to potential soil erosion and soil resources impacts similar to those discussed for the larger Planning Area. Consequently, Mitigation Measures S-1 and S-2 could be implemented to protect erodible soils before granting the lease or included as a lease stipulation.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impact would occur.

4.9.4 Impacts of Alternative B

Alternative B would allow leasing in existing oil and gas fields defined by DOGGR with 754,000 acres closed to leasing. Regardless, the open areas could experience exploration by up to 32 new wells and would have similar potential for creating soil disturbance and increased soil erosion as Alternative A although on slightly fewer acres as it would develop fewer wells.

Mitigation Measures S-1 (Prepare and Submit SWPPP) and S-2 (Prepare and Submit Reclamation Plan) (see full text in Appendix C) would apply to Alternative B.

Leases Subject to Settlement Agreement

Under Alternative B, the majority of BLM-managed mineral estate that contain the 14 non-NSO leases would be closed to leasing. If new wells were drilled in the open areas over the next 15 to 20 years, the soil resources impacts and mitigation are the same as Alternative A, Subalternative 1.

4.9.5 Impacts of Alternative C

Alternative C would allow leasing in high oil and gas occurrence potential areas with 394,400 acres closed to leasing. Regardless, the open areas could experience exploration by up to 37 new wells and would have the same potential for soil resources access restrictions as Alternative A.

Mitigation Measures S-1 (Prepare and Submit SWPPP) and S-2 (Prepare and Submit Reclamation Plan) (see full text in Appendix C) would apply to Alternative C.

Leases Subject to Settlement Agreement

Under Alternative C for the 14 non-NSO leases, the soils resources impacts and mitigation are the same as Alternative A, Subalternative 1.

4.9.6 Impacts of Alternative D

Alternative D would allow leasing in Federal mineral estate underlying BLM surface estate areas with 655,400 acres closed to leasing. The open areas could experience exploration by up to 37 new wells and would have the same potential for impacts to soil resources as Alternative A.

Mitigation Measures S-1 (Prepare and Submit SWPPP) and S-2 (Prepare and Submit Reclamation Plan) (see full text in Appendix C) would apply to Alternative D.

Leases Subject to Settlement Agreement

Under Alternative D, the majority of BLM-managed mineral estate that contain the 14 non-NSO leases would be closed to leasing. If new wells were drilled in the open areas over the next 15 to 20 years, the soils resources impacts and mitigation are the same as Alternative A, Subalternative 1.

4.9.7 Impacts of Alternative E

Alternative E would allow leasing in Federal mineral estate outside of California DWR designated groundwater basins and sub-basins with 99,400 acres closed to leasing. The open areas could experience exploration by up to 37 new wells and would have the same soil resources impacts as Alternative A.

Mitigation Measures S-1 (Prepare and Submit SWPPP) and S-2 (Prepare and Submit Reclamation Plan) (see full text in Appendix C) would apply to Alternative E.

Leases Subject to Settlement Agreement

Under Alternative E for the 14 non-NSO leases, the soils resources impacts and mitigation are the same as Alternative A, Subalternative 1, for the areas opened under this alternative.

4.9.8 Impacts of Alternative F

Alternative F would allow leasing in Federal mineral estate in all areas unless currently closed under the 2007 Hollister Field Office RMP with 67,500 acres closed to leasing. The open areas could experience exploration by up to 37 new wells and would have the same soil resources impacts as Alternative A.

Mitigation Measures S-1 (Prepare and Submit SWPPP) and S-2 (Prepare and Submit Reclamation Plan) (see full text in Appendix C) would apply to Alternative F.

Leases Subject to Settlement Agreement

Under Alternative F for the 14 non-NSO leases, the soils resources impacts and mitigation are the same as Alternative A, Subalternative 1, for the areas opened under this alternative.

4.10 Biological Resources – Vegetation

4.10.1 Introduction

Biological resources include the plant and animal species and populations, natural communities, and ecosystem processes that occur within the Planning Area. A diversity of vegetation communities, habitats, and plant and animal species, including numerous special status species, occur on BLM surface lands. This section discusses impacts on vegetation communities and habitat, both common and sensitive, and applicable mitigation.

Vegetation communities may be recognized as sensitive or afforded other special conservation status due to high natural importance to many species (e.g., riparian or wetlands habitat); dependence of certain special-status species on the community as its habitat, including designated critical habitat; or rarity of the natural community, due either to inherent rarity or to human-related causes. Examples of particularly sensitive natural communities are aquatic and riparian habitats, coastal or inland wetlands, vernal pools, old growth forest, and the unique plant assemblages found on soils developed from certain shale, dune, and serpentine parent materials (see Section 3.10). For purposes of this analysis, sensitive natural communities include the following:

- Habitat or vegetation that may support special-status plants, fish, or wildlife;
- Habitat or vegetation meeting criteria as wetlands according to State or Federal delineation criteria;
- Riparian habitat, including any vegetation or habitat that is distinct from surrounding upland habitat, and is dependent upon intermittent, seasonal, or perennial soil moisture from a nearby source;
- Communities recognized by CDFW as sensitive (i.e., as noted in the Natural Communities List (CDFG, 2010);
- Habitat designated by USFWS as "critical habitat" for a federally listed threatened or endangered species; or
- Habitat recognized as "essential habitat" for a federally listed species, even if the habitat is excluded from the final critical habitat designation.

BLM Vegetation Goals

The Hollister Field Office Resource Management Plan (HFO RMP) for the Southern Diablo Mountain Range and Central Coast of California (BLM, 2007a) lists goals and objectives that define the desired future conditions for the vegetation resource. The goals for vegetation resources are to (1) restore, maintain, or improve ecological conditions, natural diversity, and associated watersheds of high value, high-risk native plant communities and unique plant assemblages, and (2) to restore degraded landscapes and plant communities.

To achieve this goal the following objectives are established:

- Provide a mosaic of vegetative communities to protect soil, watershed, and wildlife; maintain sustained yield of vegetation for consumptive and non-consumptive uses.
- Rehabilitate disturbed areas to stabilize soils and promote growth of desired plant communities.
- Prevent the introduction and proliferation of noxious and invasive weeds.

Methods of Analysis

The analysis of direct and indirect effects is focused on species, populations, and habitats within the Planning Area. Direct impacts are the direct or immediate effects of an action on biological resources.

Examples of direct impacts to vegetation include removal or degradation of the vegetation. Indirect impacts are those effects that are caused by or will result from the action, later in time or farther removed in distance, but are still reasonably certain to occur. Examples of indirect effects to native habitat and vegetation include erosion, sedimentation, and introduction of invasive species that may compete with native species and cause habitat degradation.

Effects to vegetation may be short-term and temporary or long-term and permanent. See Section 4.1.2 for definitions of these terms specific to this document. Short-term and temporary impacts refer to project effects such as construction-phase disturbance, without long-term or permanent land use conversion, so that vegetation may return to a more natural condition or may be actively revegetated or enhanced within a few years. An example of a short-term and temporary impact is removal or disturbance of annual herbaceous plant cover with minimal soil disturbance or compaction, or with subsequent revegetation. Long-term and permanent impacts would preclude most natural vegetation and habitat function throughout the life of a proposed project, or longer. Examples of long-term impacts are removal of woody vegetation for well pads and access roads. Most annual herbaceous cover (e.g., annual grasslands) will recover within a year or two. Woody vegetation and specialized herbaceous assemblages may take several years to a few decades to re-establish, and may necessitate active revegetation or other measures.

Potential effects of management actions to vegetation and special-status plant species, populations, and habitats were identified by a team of biologists. A GIS data set and overlays of resources and land uses was used to analyze effects. In the absence of quantitative data, best professional judgment was used to provide qualitative information.

BLM is unable to quantify impacts to vegetative resources from the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.10. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects to vegetative resources from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground. Other incomplete or unavailable information includes the type(s) of development(s) and site-specific resource conditions because it's impossible for BLM to know how, where, or when leases would be developed.

A comprehensive survey of the Planning Area is not feasible, or reliable, because the timing, intensity, and/or location of future leasing and development activities is unknown. Therefore, BLM is unable to quantify effects on specific habitat types under the range of alternatives.

Nonetheless, it is still possible to make informed decisions regarding impacts to vegetation and special status plant species, based upon an understanding of impacts that are known to affect species in general. For example, the evaluation of such impacts considers current resource conditions described in Section 3.10, and the regulatory framework described in Appendix J.

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of federal minerals in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99 percent) of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects on biological resources in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

Assumptions

Assumptions used in this impact analysis include the following:

- All actions undertaken as part of this RMPA would be assessed in accordance with the National Environmental Policy Act (NEPA) and the Federal Endangered Species Act. If required, consultation with the USFWS would be completed. Best Management Practices (BMPs), Standard Operating Procedures (SOPs), mitigation measures, and terms and conditions in this RMPA and subsequent NEPA documents and biological opinions will be applied and followed.
- Valid existing rights, such as existing oil and gas leases, private mineral rights, and existing land use authorizations, would be honored, but BMPs, SOPs, stipulations, mitigation measures, and terms and conditions in this RMPA and subsequent NEPA documents and biological opinions will be applied and followed.
- If additional special status species or critical habitat is designated or discovered, the objectives and decisions in this RMPA would extend to such species as well.
- Over time, species distribution may change. Management action locations would change accordingly.
- Impacts on special status species would be similar to those discussed for species with no special status. Special status species may be more restricted in distribution, reducing the likelihood that certain activities would interact with them. However, impacts on special status species could be more pronounced due to reduced population sizes and ranges and increasing threats. More emphasis would be placed on avoiding or minimizing project effects on special status species since their populations are already in decline. Similarly, more emphasis would be placed on implementing conservation actions for special status species.

Generalized impacts from oil and gas development, including hydraulic fracturing and other well stimulation techniques, are common to all alternatives. These generalized impacts are presented below. The impact discussion presented for each alternative focus on the particular impacts of that alternative and builds on the discussion of generalized impacts that occur under all alternatives.

Management Actions

The ROD (BLM, 2007) lists a number of land use management actions to address identified issues, management concerns, and current and projected future uses of the lands administered by the CCFO in the Planning Area. The area-wide management actions that may be relevant to oil and gas development include, but are not limited to:

- **VEG-COM2.** Include mitigation measures to protect or enhance riparian areas in all activity or project plans.
- **VEG-C1.** Rehabilitate vegetative cover following wildland fires and/or other surface-disturbing activities in a timely manner. Allow use of non-persistent (or temporary), non-native, non-invasive species to be used in re-vegetation materials.
- **VEG-C3.** Mitigate or relocate proposed activities within 250 feet of riparian vegetation if the activities have long-term negative impacts on riparian resources.
- **VEG-C6.** Expand the use of an Integrated Pest Management program to prevent the introduction and proliferation of noxious and invasive weeds on 10,000 acres within 10 years throughout the resource area.

Lease Stipulations

Lease stipulations are used to protect resource values. See discussion in Section 2.5.1. Controlled Surface Use (CSU) stipulation means that use and occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operation constraints that may modify the lease rights. The specific constraints would be applied based on the biological resources present and may include provisions to address protected species; sensitive species; critical habitat; raptors; or priority species, plant communities, and habitat. No Surface Occupancy (NSO) stipulation prohibits any surface disturbance on the lease land.

BMPs and SOPs

The BMPs and SOPs for this RMPA (Appendix D: Sections 1.2 through 1.6, and 1.8) include a number of measures that would reduce impacts to vegetation and habitat. The topics addressed are briefly summarized below; see Appendix D for complete text of measures.

- Conduct biological surveys prior to disturbance and at the appropriate time of year to detect sensitive species and important biological resources. Conduct surveys in compliance with agency protocols.
- Minimize surface disturbance and avoid and minimize impacts to biological resources. Use previously disturbed areas to the extent practicable. Design projects to minimize habitat impacts and fragmentation.
- Avoid vernal pools, natural ponded waters, and washes during geophysical exploration.
- Design stream crossings to minimize adverse impacts to soils, water quality, and riparian vegetation. Maintain natural drainage patterns.
- Perform in-kind compensation for impacted habitat.
- Conduct monitoring by BLM staff and BLM-approved biologists.
- Conduct a worker education program to train project personnel on sensitive biological resources.
- Control vehicle speeds to reduce potential for roadkill, to minimize dust, and to protect sensitive animals and habitats. Use existing roads to the greatest extent practicable. Prohibit unapproved off-road travel.
- Control fugitive dust.
- Protect air quality.
- Minimize erosion and sedimentation. Protect water quality.
- Contain oil spills. Promptly notify the appropriate agencies of oil spill events. Prevent discharge of biological toxicants onto the ground surface. Clean up hazardous spills.
- Minimize the introduction and spread of weeds.
- Recontour and restore disturbed sites and unneeded roads to natural conditions. Develop restoration plans and requirements. Conduct restoration monitoring.

4.10.2 Impacts Common to All Alternatives

Under the Reasonably Foreseeable Development (RFD) Scenario for oil and gas development on Federal mineral estate in the Planning Area, within the next 15 to 20 years there is expected to be: zero to 32 new development wells, most likely all within the existing Coalinga, San Ardo, Lynch Canyon, and Jacalitos fields, but potentially occurring anywhere that is open to oil and gas leasing; 3 to 5 exploratory wells outside existing fields, most if not all in areas of high oil and gas occurrence potential; and geophysical exploration. New surface disturbance of 22 to over 206 acres is expected to be associated with this development. Areas of high oil and gas occurrence potential (Figure 4 of the RFD Scenario) generally correspond to identified oil and gas plays within the San Joaquin and Salinas Basins. See Appendix B for full details.

Oil and gas leasing would have short-term and long-term direct and indirect effects on vegetation and habitat if new or existing leases are developed. Geophysical exploration would result in many of the same impacts as other oil and gas activities but often results in short-term impacts on biological resources, particularly if the ground disturbance is confined to previously disturbed areas or to grasslands or similar vegetation types where natural recovery occurs within a short time span without additional restoration efforts.

Oil and gas development results in both short-term and long-term vegetation loss from installing roads, pipelines, power lines, drilling pads, sumps, and production facilities; from contouring surface profiles; and from making other surface modifications. Installation of roads and pipelines results in vegetation removal along linear routes, fragmenting the undisturbed vegetation. Construction can damage or destroy vegetation. Surface disturbance and travel on dirt roads create dust, which reduces photosynthesis and reproduction in plants. Oil spills or leaks can coat vegetation and soil. Soil disturbance can promote invasion or spread of non-native weeds. Weed species not currently present in the area can be inadvertently introduced and spread by oil field workers and equipment.

Depending on the affected vegetation, the loss of relatively small acreages for activities related to oil and gas development could cause substantial reduction of fish and wildlife habitat values. Similarly, depending on the affected vegetation community, the loss of relatively small acreages for oil and gas development could cause substantial reduction in the overall extent of the community. By contrast, activities (and associated disturbance) affecting sites with little native habitat value would not have substantial impacts to fish and wildlife habitat or sensitive vegetation communities. Examples of sites with little native habitat value include land already in industrial use such as operating well pads or other production-related disturbed lands. Note, however, that vegetation and habitat in the immediate vicinity of operating well pads or other infrastructure may support special-status plants and animals.

Some future oil and gas leases may be located entirely or partially on open space lands supporting native vegetation types including, but not limited to, those described in Section 3.10. Impacts to native vegetation would be most likely for oil and gas development activities located outside of existing oil and gas fields or in fields where oil and gas production land uses are intermixed with remnant native habitats.

Oil and gas development activities could affect wetlands as defined by Section 404 of the Clean Water Act. These impacts could include placing fill material into jurisdictional waters to provide level, dry work areas, drill pads, or roadways; constructing roadways, culverts, or other crossing structures across jurisdictional channels; installing channel armoring (such as riprap) in a channel near a work site to prevent flooding or erosion; constructing impoundments or detention basins on jurisdictional channels; grading or other site preparation that eliminates or redirects natural runoff; or impacts from spills of hazardous materials that may enter jurisdictional waters. Potential adverse effects are not limited to wetlands or mapped "blueline" streams; similar effects to intermittent channels or washes may also be substantial. Impacts to waters, including intermittent channels, could also affect downstream wetlands, riparian, or aquatic habitat and fish or wildlife found in those downstream habitats.

In addition, oil and gas development activities could affect lakes or streams, including seasonally or intermittently dry lakes or streams that may not meet the Federal definition as wetlands, yet fall under State or Federal jurisdictional criteria as waters of the State or waters of the U.S. Even in the absence of State or Federal jurisdiction, the impacts of oil and gas development activities to perennial, seasonal, or intermittent wetlands, lakes, or streams may affect special-status wildlife, local biological diversity, or special-status natural communities.

Projects affecting waters of the State or waters of the U.S. will be subject to permitting under the California Fish and Game Code and Federal Clean Water Act. Federal CWA permitting is required for projects that would place dredged or fill material into jurisdictional waters of the U.S. State authorization is required if projects would substantially divert or obstruct the natural flow of any river, stream, or lake; substantially

change or use any material from the bed, channel, or bank of any river, stream, or lake; or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.

In addition to the direct impacts to habitat, oil and gas development activities could have several direct or indirect impacts to surrounding vegetation and habitat. The extent and significance of these indirect habitat effects would be dependent on the sensitivity of adjacent habitat and the fish and wildlife it supports. These impacts may include:

- Introduction or spread of invasive species;
- Dust caused by project activities or vegetation removal;
- Altered local surface hydrology, causing short-term or long-term habitat inundation behind berms, or interruption of downstream flow and sediment delivery; or
- Reduced surface or groundwater availability, caused by pumping from a surface source such as a lake, stream, spring, or a groundwater source, reducing surface or soil water availability for wildlife drinking water sources, or wetland, riparian, or aquatic habitat.
- Spills and releases of well stimulation fluids, hydrocarbons, or other project-related contaminants, and resulting cleanup efforts, may cause short-term and temporary and long-term and permanent loss and degradation of habitat.

Surface water contamination, if any, could affect vegetation and wetland resources at the contamination site or downstream. Potential effects to biological resources include damage to plant roots or physiology if the contaminant is taken up by plants. Spilled hydraulic fracturing fluid, or returned fluid mixed with oil, probably would not behave in the same way as oil (i.e., the hydraulic fracturing fluid would generally be water soluble, whereas oil would not).

Groundwater contamination, if any, could affect these resources at natural seeps or springs where the groundwater source discharges to the surface. Additionally, groundwater contamination could affect biological resources if a groundwater well is used as a water source for wetlands, fisheries, or other wildlife benefits (e.g., a water source for managed wetlands or for wildlife drinking). The actual distance to seeps, springs, or wells that could be affected will be site-specific, dependent on the groundwater resource extent, and flow characteristics.

Potential surface water and groundwater quality impacts are described in Section 4.7 (Groundwater Resources) and Section 4.8 (Surface Water Resources). The operator must comply with all applicable regulations regarding storage and handling of project-related contaminants.

Potential air quality impacts are described in Section 4.5 (Air Quality). Air pollution generated by oil and gas development activities may also affect the health of vegetation. The operator must comply with all applicable regulations regarding air quality.

Climate change is described in Section 4.6 (Climate Change/Greenhouse Gas Emissions). Climate change is likely to cause drier summer vegetation conditions (i.e., decreased fuel moisture) and increasingly severe wildfires; reduced or altered food, cover, and water availability for fish and wildlife; habitat conversion as dominant plants are excluded from warmer and drier conditions at their lower elevational and latitudinal extents; generally earlier timing of seasonal activity periods for plants and animals (e.g., blooming, bird nesting, and insect flight seasons); reduced populations of anadromous fish (e.g., salmon and steelhead) and coastal birds, which are both dependent on productive nearshore feeding areas; and inundation of low-lying coastal habitats, including wetlands.

Vulnerability to the effects of climate change varies widely by species, according to ranges of tolerance to physical and biotic conditions for each species, and interaction among these inherent ranges and other

changes throughout the environment. Retention of biological connectivity and facilitation of wildlife movement among habitat areas is the primary mitigation strategy to minimize expected effects of global climate change to biological resources. Many species or populations may need to move on a regional scale from areas of declining habitat suitability to areas of stable or increasing habitat suitability.

Oil and gas leasing on Federal mineral estate within the Planning Area would generate greenhouse gas emissions that contribute to global climate change. The effects of global climate change, in turn, would affect biological diversity. However, under all alternatives, this contribution would be minor. New oil and gas development on up to 206 acres within the Planning Area would also have a minor effect on regional biological connectivity.

General Mitigation

Measures taken to minimize impacts on biological resources, including vegetation, would continue to be imposed. These include such protective measures as lease stipulations, Best Management Practices (BMPs) and Standard Operating Procedures (SOPs) for oil and gas development (described above), and the closure of sensitive areas to oil and gas development. All of these actions would benefit vegetation and habitats at the local and landscape scales by eliminating or reducing negative impacts stemming from development.

Additionally, site-specific evaluations of proposed ground disturbing activities will include delineations of State or federally jurisdictional hydrologic features, including wetlands, to determine whether State or Federal permitting may be required. Where proposed activities may occur under State or Federal jurisdiction, each lease holder or applicant will provide notification or application materials to CDFW, RWQCB, and USACE as required under Sections 1600-1616 of the California Fish and Game Code and Sections 401 and 404 of the Clean Water Act.

Implementation of lease stipulations, BMPs, SOPs, and compliance with CWA requirements would avoid and/or minimize potential impacts to biological resources. Species-specific surveys and species avoidance and habitat protection and compensation measures would minimize impacts of oil and gas development activities on special status species.

Under any of the Alternatives analyzed below, the actual impacts of future oil and gas development would depend on the specific extent and locations of surface disturbance. Each alternative identifies specific areas as either open or closed to development, or subject to NSO stipulations.

4.10.3 Impacts of Alternative A (No Action)

Alternative A is the No Action Alternative. The No Action Alternative would continue the current management goals, objectives, and direction for oil and gas as specified in the 2007 HFO RMP. Areas currently open would remain open to oil and gas leasing, and areas closed under the 2007 RMP would remain closed (Wilderness, Wilderness Study Areas (WSAs), Clear Creek Serpentine ACEC, and Fort Ord National Monument).

No Surface Occupancy (NSO) stipulations would be applied to new leases in ACECs and Recreation and Public Purpose (R&PP) leases. The NSO stipulation prohibits any surface disturbance on the lease land. Where applicable, the NSO stipulations prevent surface disturbance and potential for interactions between oil field activities and biological resources in these areas. The Endangered Species stipulation from the 2007 HFO RMP would apply in all areas open to leasing (see Appendix D in BLM, 2007).

Under Alternative A, approximately 86 percent of BLM oil and gas Federal mineral estate would be open to oil and gas leasing with the CSU – Protected Species stipulation and subject to impacts as described in Section 4.10.2. Approximately 8 percent would be closed to oil and gas leasing and 6 percent would be subject to NSO lease stipulations. Under the RFD Scenario, the expected zero to 32 new development wells, most likely all within the existing Coalinga, San Ardo, Lynch Canyon, and Jacalitos fields, but

potentially occurring anywhere that is open to oil and gas leasing, could still occur. The 3 to 5 exploratory wells outside existing fields could only occur within any of the Federal mineral estate lands open to oil and gas leasing.

Alternative A has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major, depending on the extent and locations of surface disturbance for exploration and development. For example, impacts of new development on common vegetation communities that do not support special-status species would be minor, whereas new surface disturbance in sensitive vegetation types such as riparian communities or vernal pools could have major effects to vegetation and habitat. Site-specific analysis would be required to determine actual extent of the impacts.

Under Alternative A, measures to minimize impacts on vegetation communities and habitat would continue to be applied to oil and gas leases. Examples of these measures are oil and gas stipulations included in Appendix D of the RMP FEIS (BLM, 2006), and the BMPs and SOPs that are included in Appendix D of this RMPA.

The Endangered Species stipulation from the 2007 HFO RMP would apply in all areas open to leasing. Although primarily directed at special status species, this stipulation also would protect other sensitive resources such as riparian zones, vernal pools and other wetlands, floodplains, rare and unique edaphic plant communities when practical and feasible alternatives exist.

General mitigation as described in Section 4.10.2 would apply. Implementation of lease stipulations, BMPs, and SOPs would require site-specific analysis of potential impacts to vegetation resources, avoidance of sensitive vegetation resources where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A, Subalternative 1, all areas of the 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas leasing and would be issued, as such they would be subject to resulting potential impacts as discussed above. The lease areas total approximately 17,600 acres. These leases do not include any lands designated as Wilderness, WSAs, Clear Creek Serpentine ACEC, or Fort Ord National Monument. Details regarding the vegetation types found within each lease can be found in Section 3.10.4. The Endangered Species stipulation from the 2007 HFO RMP would apply in all areas of the leases. Impacts and mitigation within these leases would be the same as described for the Planning Area as a whole (Section 4.10.2).

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impact would occur.

4.10.4 Impacts of Alternative B

Under Alternative B, lands within oil and gas fields and a 0.5-mile buffer area, as currently defined by DOGGR, would be open and all other areas would be closed. All lands open to leasing would implement Controlled Surface Use (CSU) stipulations as appropriate. The CSU stipulations mean that use and occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operation constraints that may modify the lease rights. The specific constraints would be applied based on the biological resources present and may include provisions to address protected species; sensitive species; critical habitat; raptors; or priority species, plant communities, and habitat, and specific constraints based on surface restrictions,

Under Alternative B, approximately 4 percent of BLM Federal mineral estate is identified as open to oil and gas leasing and subject to impacts as described in Section 4.10.2. Approximately 96 percent would be closed to leasing, which would eliminate surface disturbance and potential for interactions between oil field activities and biological resources in these areas.

Potential impacts within existing oil and gas fields and the surrounding 0.5-mile buffers would vary depending on site-specific factors, such as the type of native vegetation and habitat present in the field, and the extent and location of oil and gas development disturbance. All the development would be limited to the existing oil and gas fields and surrounding 0.5-mile buffers. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources.

The impacts of Alternative B on vegetation and habitat are likely to be substantially reduced from existing conditions (i.e., the No Action Alternative) and Alternative F due to limitations on the locations of future wells. Alternative B would have up to 32 wells drilled, rather than 37, because it is limited to the existing oil and gas fields and 0.5-mile buffer area and the 5 exploratory wells would not be drilled. As a result, ground disturbance associated with Alternative B would be up to 179 acres.

Alternative B has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 179 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. For example, impacts of new development on common vegetation communities that do not support special-status species would be minor, whereas new surface disturbance in sensitive vegetation types such as riparian communities or vernal pools could have major effects to vegetation and habitat. These resources could be located within existing oil and gas fields, or within the surrounding 0.5-mile buffer areas. Site-specific analysis would be required to determine actual impacts.

Under Alternative B, measures to minimize impacts on vegetation communities and habitat would continue to be applied to oil and gas leases. Examples of these measures are the oil and gas stipulations (Appendix C of this RMPA) and the BMPs and SOPs that are included in Appendix D of this RMPA.

General mitigation as described in Section 4.10.2 would apply. Implementation of lease stipulations, BMPs, and SOPs would require site-specific analysis of potential impacts to vegetation resources, avoidance of sensitive vegetation resources where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement

Under Alternative B, a portion of the area of 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas development (Section 2.7.2 and Table 2-3) and subject to resulting impacts as discussed above for the Planning Area. The remaining areas of the leases would be closed to oil and gas development. Depending on location, some entire leases would be open for development, others would be all or nearly all closed. Many would have a mixture of open and closed areas. Of the total lease area of approximately 17,600 acres, 22 percent would be open and 78 percent would be closed. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. Impacts and mitigation within these leases would be the same as described for the Planning Area as a whole (Section 4.10.2). Details regarding the vegetation types found within each lease can be found in Section 3.10.4.

4.10.5 Impacts of Alternative C

Under Alternative C, high oil and gas occurrence potential areas would be open. Moderate, low, and no oil and gas occurrence potential areas would be closed, as well as core population areas of the giant kangaroo rat in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills. Areas closed under the 2007 RMP would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, and Fort Ord National Monument). All lands open to leasing would have CSU stipulations, as described under Alternative B. NSO stipulations

would apply to critical habitat, BLM-developed recreation and administration sites, and special status split estate lands (state parks, county parks, conservation easements, land trusts, and scenic designations). The NSO stipulation prohibits any surface disturbance on the lease land. Under Alternative C, approximately 47 percent of BLM oil and gas Federal mineral estate are identified as open to oil and gas leasing and subject to impacts as described in Section 4.10.2. Approximately 49 percent would be closed to leasing and 4 percent would be subject to NSO stipulations, which would eliminate surface disturbance and potential for interactions between oil field activities and biological resources in these areas.

Potential impacts to vegetation resources would vary depending on site-specific factors, such as the type of native vegetation and habitat present and the extent and location of oil and gas development disturbance. NSO stipulations would avoid impacts to biological resources on critical habitat and special-status species on split estate lands.

Depending on where new oil and gas leases are located, the impacts of Alternative C on vegetation and habitat are likely to be reduced from existing conditions (i.e., the No Action Alternative) and Alternative F, but greater than Alternative B. Alternative C has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. For example, impacts of new development on common vegetation communities that do not support special-status species would be minor, whereas new surface disturbance in sensitive vegetation types such as riparian communities or vernal pools could have major effects to vegetation and habitat. These resources could be located within existing oil and gas fields, or within the other areas identified as open and without the NSO stipulation under this alternative. Site-specific analysis would be required to determine actual impacts.

Under Alternative C, measures to minimize impacts on vegetation communities and habitat would continue to be applied to oil and gas leases. These measures are lease stipulations, BMPs and SOPs, and general mitigation as described in Section 4.10.2. As noted above under Alternative B, site-specific analysis of potential impacts to vegetation resources would be required to develop site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement

Under Alternative C, the 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas development (Section 2.8.2) and subject to resulting impacts as discussed above for the Planning Area. These leases do not include any lands designated as Wilderness, WSAs, Clear Creek Serpentine ACEC, or Fort Ord National Monument. Details regarding the vegetation types found within each lease can be found in Section 3.10.4. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. Impacts and mitigation within these leases would be the same as described for the Planning Area as a whole (Section 4.10.2).

4.10.6 Impacts of Alternative D

Under Alternative D, Federal mineral estate underlying BLM surface estate would be open. Split estate lands would be closed. The Ciervo-Panoche Natural Area would be closed. Areas closed under the 2007 RMP would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, and Fort Ord National Monument). All lands open to leasing would have CSU stipulations, described under Alternative B. NSO stipulations would apply to ACECs and R&PP leases. The NSO stipulation prohibits any surface disturbance on the lease land.

Under Alternative D, approximately 16 percent of BLM oil and gas Federal mineral estate is identified as open to oil and gas leasing and subject to impacts as described in Section 4.10.2. Approximately 83 percent would be closed to leasing and 1 percent would be subject to NSO stipulations, which would eliminate

surface disturbance and potential for interactions between oil field activities and biological resources in these areas.

Potential impacts would vary depending on site-specific factors, such as the type of native vegetation and habitat present and the extent and location of oil and gas development disturbance. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. NSO stipulations would avoid impacts to biological resources on critical habitat and special status split estate lands. No oil and gas development would occur and there would be no impacts to biological resources in the Ciervo-Panoche Natural Area.

Depending on where new oil and gas leases are located, the impacts of Alternative D on vegetation and habitat are likely to be considerably reduced from existing conditions (i.e., the No Action Alternative) and Alternative F, and somewhat reduced from Alternative C, but greater than Alternative B. Alternative D has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. For example, impacts of new development on common vegetation communities that do not support special-status species would be minor, whereas new surface disturbance in sensitive vegetation types such as riparian communities or vernal pools could have major effects to vegetation and habitat. These resources could be located within existing oil and gas fields or areas identified as open, and without the NSO stipulation under this alternative. Site-specific analysis would be required to determine actual impacts.

Under Alternative D, measures to minimize impacts on vegetation communities and habitat would continue to be applied to oil and gas leases. These measures are lease stipulations, BMPs and SOPs, and general mitigation as described in Section 4.10.2. As noted above under Alternative B, site-specific analysis of potential impacts to vegetation resources would be required to develop site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement

Under Alternative D, a portion of the area of the 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas development (Section 2.10.2 and Table 2-3) and subject to resulting impacts as discussed above for the Planning Area. The remaining areas of the leases would be closed to oil and gas development. One lease would be entirely open; one would be entirely closed. Most leases would have a mixture of open and closed areas. All leases in the Ciervo-Panoche Natural Area would be closed. The leases do not include any lands designated as Wilderness, WSAs, Clear Creek Serpentine ACEC, or Fort Ord National Monument. Details regarding the vegetation types found within each lease can be found in Section 3.10.4. Of the total lease area of approximately 17,600 acres, 25 percent would be open areas and 75 percent would be closed. Impacts and mitigation within these leases would be the same as described for the Planning Area as a whole (Section 4.10.2).

4.10.7 Impacts of Alternative E

Under Alternative E, Federal mineral estate outside California DWR Bulletin 118 groundwater basins and sub-basins would be open, while Federal mineral estate within these basins would be closed. Areas closed under the 2007 RMP would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, and Fort Ord National Monument). All lands open to leasing would have CSU stipulations, as described under Alternative B. NSO stipulations would apply to certain Hydrologic Units and areas within 0.25 miles of non-impaired, perennial surface waters and Wild and Scenic Rivers (See Chapter 2).

Under Alternative E, approximately 63 percent of BLM oil and gas Federal mineral estate is identified as open to oil and gas leasing and subject to impacts as described in Section 4.10.2. Approximately 12 percent would be closed to leasing and 26 percent would be subject to NSO stipulations, which would eliminate

surface disturbance and potential for interactions between oil field activities and biological resources in these areas.

Potential impacts would vary depending on site-specific factors, such as the type of native vegetation and habitat present and the extent and location of oil and gas development disturbance. Impacts would occur only outside California DWR Bulletin 118 groundwater basins and sub-basins and the other lands that would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, and Fort Ord National Monument). CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. NSO stipulations would avoid impacts to biological resources within specified Hydrologic Units and within 0.25 miles of non-impaired, perennial surface waters and Wild and Scenic Rivers, and avoid and minimize impacts to these types of waters and associated wetlands.

Depending on where new oil and gas leases are located, the overall impacts of Alternative E on vegetation and habitat are likely to be reduced from existing conditions (i.e., the No Action Alternative) and Alternative F, but may be similar to or greater to impacts of Alternatives B, C, and D. Impacts of Alternative E on waters and associated wetlands are likely to be reduced from existing conditions and the other alternatives. Alternative E has the potential to result in short-term and temporary and long-term and permanent adverse impacts that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. For example, impacts of new development on common vegetation communities that do not support special-status species would be minor, whereas new surface disturbance in sensitive vegetation types such as riparian communities or vernal pools could have major effects to vegetation and habitat. These resources could be located within existing oil and gas fields, or within open areas as identified in the alternative. Site-specific analysis would be required to determine actual impacts.

Under Alternative E, measures to minimize impacts on vegetation communities and habitat would continue to be applied to oil and gas leases. These measures are lease stipulations, BMPs and SOPs, and general mitigation as described in Section 4.10.2. Site-specific analysis of potential impacts to vegetation resources would be required to develop site-specific mitigation measures to avoid and minimize impacts to biological resources and certain types of waters and associated wetlands.

Leases Subject to Settlement Agreement

Under Alternative E, a portion of the area of the 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas development (Section 2.11.2) and subject to resulting impacts as discussed above for the Planning Area. The remaining areas of the leases would be closed to oil and gas development or subject to NSO stipulations. Some entire leases would be open for development; one lease would be entirely within the NSO stipulation area. Most leases would have a mixture of open and closed areas and some would have NSO stipulations on part of the areas. These leases do not include any lands designated as Wilderness, WSAs, Clear Creek Serpentine ACEC, or Fort Ord National Monument. Details regarding the vegetation types found within each lease can be found in Section 3.10.4. Of the total lease area of approximately 17,600 acres, 57 percent would be open areas, 2 percent would be closed, and 41 percent would be open with NSO. Impacts and mitigation within these leases would be the same as described for the Planning Area as a whole (Section 4.10.2).

4.10.8 Impacts of Alternative F

Under Alternative F, most areas currently open would remain open to oil and gas leasing, and areas closed under the 2007 RMP would remain closed (Wilderness, Wilderness Study Areas (WSAs), Clear Creek Serpentine ACEC, and Fort Ord National Monument).

NSO stipulations would be applied to new leases in selected ACECs (i.e., the Joaquin Rocks ACEC and the ACECs within the Ciervo-Panoche Natural Area) as well as GKR core population areas. Where

applicable, the NSO stipulations prevent surface disturbance and potential for interactions between oil field activities and biological resources in these areas. The CSU stipulations would apply in all areas open to leasing.

Depending on where new oil and gas leases are located, the impacts of Alternative F on vegetation are likely to be similar to existing conditions (i.e., the No Action Alternative). However, the application of NSO stipulations targets selected sensitive areas to protect specific biological resources including vegetation and habitat, and reducing potential impacts to vegetation. Under Alternative F, approximately 86 percent of BLM oil and gas Federal mineral estate would be open to oil and gas leasing with the CSU – Protected Species stipulation and subject to impacts as described in Section 4.10.2. Approximately 8 percent would be closed to oil and gas leasing and 5 percent would be subject to NSO lease stipulations. Under the RFD Scenario, the expected zero to 32 new development wells, most likely all within the existing Coalinga, San Ardo, Lynch Canyon, and Jacalitos fields, but potentially occurring anywhere that is open to oil and gas leasing, could still occur. The 3 to 5 exploratory wells outside existing fields could only occur within any of the Federal mineral estate lands open to oil and gas leasing.

Alternative F has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major, depending on the extent and locations of surface disturbance for exploration and development, as described above for Alternative A. Site-specific analysis would be required to determine actual extent of the impacts.

Under Alternative F, measures to minimize impacts on vegetation communities and habitat would continue to be applied to oil and gas leases. These measures are lease stipulations, BMPs and SOPs, and general mitigation as described in Section 4.10.2. Site-specific analysis of potential impacts to vegetation resources would be required to develop site-specific mitigation measures to avoid and minimize impacts to biological resources and certain types of waters and associated wetlands.

General mitigation as described in Section 4.10.2 would apply. Implementation of lease stipulations, BMPs, and SOPs would require site-specific analysis of potential impacts to vegetation resources, avoidance of sensitive vegetation resources where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement

Under Alternative F, the 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas development (Section 2.8.2) and subject to resulting impacts as discussed above for the Planning Area. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. Impacts and mitigation would be to the same as those for the Planning Area as a whole (Section 4.11.2).

4.11 Biological Resources – Wildlife Habitat

4.11.1 Introduction

This section discusses impacts on wildlife species and their habitats, along with applicable mitigation. Special status wildlife species are addressed in Section 4.12 of this document. In analyzing management actions, the Hollister Field Office Resource Management Plan (HFO RMP) for the Southern Diablo Mountain Range and Central Coast of California (BLM, 2006 and 2007) addresses key species and their habitats. Key species include those of economic interest (e.g., native and non-native game animals); species or groups that serve as indicators of ecosystem health or the effects of management activities; and sensitive, rare, threatened, and endangered (RTE) species. See Section 3.11 for a discussion of game and indicator species. RTE wildlife species are addressed in Section 4.12 (Special Status Species) of this document.

BLM Wildlife Goals

The ROD (BLM, 2007) lists goals and objectives that define the desired future conditions for the resource. The goal for fish and wildlife is to ensure diverse, structured, resilient, and connected habitat on a landscape level to support viable and sustainable populations of wildlife, fish, and other aquatic organisms.

To achieve the goal for fish and wildlife, the following objectives are established:

- Maintain or enhance viable, healthy, and diverse populations of native and desired species, including special status species, where appropriate.
- Conserve habitat consistent with the *Installation-wide Multispecies Habitat Management Plan for Former Fort Ord, California*.
- Conserve habitat for migratory birds and species listed on the USFWS list of Birds of Conservation Concern.

Methods of Analysis

The analysis of direct and indirect effects is focused on species, populations, and habitats within the Planning Area. Direct impacts are the direct or immediate effects of an action on biological resources. Examples of direct impacts to wildlife and habitat include mortality, injury, or displacement of animals; removal or degradation of native habitat; interference with fish and wildlife movement or migration; disruption of essential wildlife behaviors such as feeding, breeding, and sheltering; and disturbance to animals and habitat from noise, light, or dust. Indirect impacts are those effects that are caused by or will result from the action, later in time or farther removed in distance, but are still reasonably certain to occur. Examples of indirect effects to native habitat and vegetation include erosion, sedimentation, and introduction of invasive species that may compete with native species and cause habitat degradation. An example of an indirect effect to fish and wildlife is increased predation due to certain habitat alterations (e.g., perch sites or "subsidies" for predators). See Section 4.10.1 for a complete description of analysis methodology.

Generalized impacts from oil and gas development, including hydraulic fracturing and other well stimulation techniques, are common to all alternatives. These generalized impacts are presented below. The impact discussion presented for each alternative focuses on the particular impacts of that alternative and builds on the discussion of generalized impacts that would occur under all alternatives.

BLM is unable to quantify impacts to wildlife habitat from the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.11. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts,

as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects to wildlife habitat from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground. Other incomplete or unavailable information includes the type(s) of development(s) and site-specific resource conditions because it's impossible for BLM to know how, where, or when leases would be developed.

A comprehensive survey of the Planning Area is not feasible, or reliable, because the timing, intensity, and/or location of future leasing and development activities is unknown. Therefore, BLM is unable to quantify effects on specific habitat types under the range of alternatives. Nonetheless, it is still possible to make informed decisions regarding impacts to special status species, based upon an understanding of impacts that are known to affect species in general. For example, the evaluation of such impacts considers current resource conditions described in Section 3.11, and the regulatory framework described in Appendix J.

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of federal minerals in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99 percent) of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects on biological resources in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

Assumptions

The term habitat refers to the environment and ecological conditions where a species is found. One major component of most wildlife habitat is vegetation. Vegetation reflects many aspects of habitat, including regional climate, physical structure, and biological productivity and food resources for many wildlife species. Thus, vegetation is a useful overarching descriptor for habitat, and it is the primary factor in this analysis of impacts to wildlife habitat. Impacts to vegetation communities and habitat are discussed in Section 4.10 and the particular impacts to wildlife and habitat of each alternative would be generally similar to those discussed in Section 4.10, as would applicable mitigation. The assumptions used in this impact analysis are listed in Section 4.10.

Management Actions

The ROD (BLM, 2007) listed a number of land use management actions to address identified issues, management concerns, and current and projected future uses of the lands administered by the CCFO in the Planning Area. The management actions that may be relevant to oil and gas development include, but are not limited to the following. The applicable areas for each management action are noted in parentheses at the end of each description.

- **HAB-C2.** Limit disturbance, within a distance of up to 0.5 miles of nesting special status raptors (e.g., California condor, bald eagle, golden eagle, Swainson's hawk, sharp-shinned hawk, northern harrier, peregrine falcon, and burrowing owl) during courtship, nest building, incubation, and fledging periods. Limit disturbance to other raptor species, including State species of concern (e.g., osprey, sharp-shinned hawk, northern harrier, ferruginous hawk, prairie falcon, short-eared owl, long-eared owl) and common species (e.g., red-tailed hawk and American kestrel) during critical periods of their reproductive cycle on a case-by-case basis (all management areas).

- **HAB-COM3.** Mitigate or relocate man-made barriers that substantially impede migration outside of wildlife travel corridors, as appropriate (Central Coast Management Area).

Lease Stipulations

Lease stipulations are used to protect resource values. See discussion in Section 2.5.1. Controlled Surface Use (CSU) stipulations mean that use and occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operation constraints that may modify the lease rights. The specific constraints would be applied based on the biological resources present and may include provisions to address protected species; sensitive species; critical habitat; raptors; or priority species, plant communities, and habitat. The No Surface Occupancy (NSO) stipulation prohibits any surface disturbance on the lease land.

BMPs and SOPs

The BMPs and SOPs for this RMPA (Appendix D: Sections 1.2 through 1.6, and 1.8) include a number of measures that would reduce impacts to wildlife. The topics addressed are briefly summarized in Section 4.10.2; additional topics specific to wildlife are included below. See Appendix D for complete text of measures.

- Use seasonal restrictions to protect nesting raptors.
- Construct facilities and structures in conformance with wildlife protection guidelines. Design new facilities with measures to reduce hazards to wildlife.
- Provide excavations, trenches, and troughs with wildlife escape ramps. Cover pipe ends. Check for and remove trapped animals.
- Store trash and food items in closed containers and remove from the site regularly. Maintain neat and orderly sites and remove junk and trash.
- Prohibit firearms and pets in work sites.
- Screen or eliminate exposed oil sumps. Design tanks, pits, and secondary containment to prevent wildlife entry.
- Allow access to work sites for CDFW and USFWS biologists and law enforcement personnel.
- Avoid burrows and dens during geophysical exploration.

4.11.2 Impacts Common to All Alternatives

Under the Reasonably Foreseeable Development (RFD) Scenario for oil and gas development on Federal mineral estate in the Planning Area, within the next 15 to 20 years there is expected to be zero to 32 new development wells, most likely within the existing Coalinga, San Ardo, Lynch Canyon, and Jacalitos fields but potentially occurring anywhere that is open to oil and gas leasing; plus 3 to 5 exploratory wells outside existing fields, most if not all in areas of high oil and gas occurrence potential (Alternatives A, C though E); and geophysical exploration. Surface disturbance of up to 206 acres is expected to be associated with this development for all alternatives except Alternative B, which assumes up to 179 acres of disturbance within or near to existing oil and gas fields. A portion of this disturbance may be within previously disturbed areas. Areas of high oil and gas occurrence potential (Appendix B, RFD Scenario Figure 4) generally correspond to identified oil and gas plays within the San Joaquin and Salinas Basins.

Oil and gas leasing would have short-term and long-term direct and indirect effects on wildlife and habitat if new or existing leases are developed. Geophysical exploration would result in many of the same impacts as other oil and gas activities but often results in only short-term impacts on biological resources if the

ground disturbance is confined to previously disturbed areas or to grasslands or similar habitats where natural recovery occurs within a short time span, without additional restoration efforts.

Site preparation and other work associated with oil and gas development could cause displacement or mortality of fish and wildlife on the site. Animals would generally leave, or attempt to leave, during grading or clearing. Many small mammals and reptiles, as well as nestling birds or eggs, could be crushed by equipment. Other animals, including adult fish or birds, generally would flee the site where they may be subject to further adverse effects, potentially including mortality. They would be at increased risk of predation as they flush from cover during site clearing. After leaving their home territories, displaced animals may be unable to find suitable food or cover in new, unfamiliar areas. They may find themselves within the occupied territory of another individual of the same or similar species, leading to competition for resources and reduced survivorship or breeding success. In addition, oil and gas development may cause wildlife mortality, injury, or illness due to vehicle strikes; entrapment in trenches, pipes, or other supplies and equipment; drowning in stored water; or poisoning by ingestion or exposure to stored or spilled chemicals, including exposure to produced water or flowback water.

Noise and disturbance associated with oil and gas development activities may result in wildlife avoiding otherwise suitable habitat on or near work sites, leading to indirect habitat loss (Beckmann et al., 2012; Sawyer et al., 2006; Doherty et al., 2008; Bayne et al., 2008). Wildlife that remain in habitat exposed to noise and disturbance may experience physiological stress, which can affect disease resistance, survival, and reproductive success (Kight and Swaddle, 2011). Noise can also disrupt behavior, such as predator avoidance and communication, which can affect survival and reproduction (Habib et al., 2007; Francis and Barber, 2013). Noise and disturbance may also affect ecosystem structure and diversity by impacting wildlife that pollinate flowers and disperse seeds (Francis et al., 2012).

Artificial lighting may be required for oil and gas development and can disorient wildlife, leading migrating or dispersing animals off-course. Lit structures can be a collision hazard for birds. Lighting can also disrupt circadian (24-hour) rhythms, potentially affecting mating behavior, nocturnal visual communication, competition, and predation (Longcore and Rich, 2004).

Oil and gas development activities could interrupt fish or wildlife movement routes, cause habitat fragmentation, or contribute to existing habitat fragmentation at multiple geographic scales. New barriers to wildlife movement, such as roads or fences, could interrupt local biological connectivity. Culverts or other structures at stream crossings could impair fish movement upstream and downstream.

Habitat fragmentation occurs when development or other disturbance divides habitat that was once continuous into separate and smaller sections. This affects wildlife movement and the viability of the habitat to support various species. Fragmentation also increases the proportion of disturbed edge habitat to undisturbed interior habitat (edge effect) (Wilcove et al., 1986). Habitat fragmentation resulting from development of well pads, roads, and other infrastructure may cause a shift in wildlife species composition. Fragmentation favors common habitat generalists, such as raccoon (*Procyon lotor*) and American crow (*Corvus brachyrhynchos*), over more specialized, and typically rarer, species (Brittingham, no date). Development may result in a shift in biological diversity and local declines in some fish and wildlife populations (Gilbert and Chalfoun, 2011; Ingelfinger and Anderson, 2004).

Many oil and gas development activities located on operating well pads or other production-related disturbed lands and heavily disturbed sites would generally have less effect on fish or wildlife movement and habitat fragmentation than activities within or adjacent to natural habitat. Short-term and temporary effects, such as temporary construction fencing, generally would not have important or lasting effects on wildlife movement and habitat fragmentation. Oil and gas development activities would not substantially affect fish or wildlife movement or habitat fragmentation if they meet the following criteria:

- Activities are located outside any designated linkage area (as recognized by BLM, CDFW, or other resource agency, local agency, or regional conservation plan);
- The work site is surrounded by sufficient natural open space accessible to terrestrial wildlife including large mammals, small mammals, reptiles, and amphibians, such that project-related habitat conversion or fencing would not substantially interfere with local wildlife movement; and
- Activities do not include stream crossing alterations or other potential impairments to fish movement.

Alternatively, oil and gas development activities may be located entirely or partially on open space lands or in areas identified as important biological linkages or "corridors," potentially including sensitive wetland, riparian, or aquatic habitats. Substantial wildlife movement and habitat fragmentation impacts would be most likely for oil and gas development activities located outside of existing oil and gas fields, or located in operating fields where production-related land uses are intermixed with native habitats. For oil and gas development activities within recognized biological linkages, or located in habitat "corridors," habitat conversion, fencing, or other project effects may affect local wildlife movement, or require culvert or other stream crossings. These effects may be substantial without mitigation. See Section 4.10.2 for a discussion regarding the effects of climate change on vegetation and habitat, including to biological connectivity.

Oil and gas development activities could contaminate surface water or groundwater if a project causes well stimulation fluids, hydrocarbons, or other project-related contaminants including enhanced oil recovery to enter surface water or groundwater. Project-related materials that could contaminate surface water include, but are not limited to drilling fluid ("drill mud"), hydraulic fracturing fluids, produced water, crude oil, methane or other dissolved gases, crude oil mixed with hydraulic fracturing fluid or produced water, chemicals used in well-related and other activities, and fuels, lubricants, or other fluids that could leak from equipment. Potential contamination may result from spills on the site or away from the site (e.g., during transportation of project materials or wastewater, or from pipeline failure).

Project-related contaminants may be toxic to plants, fish, or wildlife. For example, drilling fluids may contain biocides, anti-corrosives, clarifiers, heavy metals, petroleum hydrocarbons, and brine. Additionally, produced water has high salinity and electrical conductivity, which can be harmful to wildlife and aquatic species that inhabit freshwater streams. In addition to elevated levels of mineral salts, produced water generally contains traces (1 to 3 percent) of petroleum oil, organic acids and elevated concentrations of heavy metals (including barium, cadmium, chromium, lead, copper and nickel). Since there are trace amounts of oil in the produced water, polycyclic aromatic hydrocarbons (PAH) and benzene, toluene, ethylbenzene and xylene (BTEX), some of which are carcinogens, are usually detected in produced water. If produced water is absorbed into stream sediments, it may cause longer-term impacts to biota. Produced water cannot be contained by traditional oil spill response methods, (e.g., containment boom and sediment berms); therefore, if spilled, it may flow further downstream and soak deeper into sediments than crude oil. If these fluids or dissolved gases enter surface water or groundwater, they may affect plants, fish, wildlife, and habitat that come into contact with them. Effects of contact with toxic chemicals can include damage to or mortality of plants, and distress, impaired health, abnormality, reproductive harm, or mortality of animals (Adams, 2011; Papoulias and Velasco, 2013; Gentes et al., 2007).

In addition to potential hazards of industrial fluids, crude oil is deleterious to wildlife. Adverse effects of oil exposure were reviewed and summarized by Trail (2006) and Ramirez (2010). For example, birds are harmed by dermal exposure (oiling of feathers), ingestion, and effects on embryos when oil contacts egg shells. Oil on feathers causes the loss of water repellency and insulation, which may result in hypothermia or hyperthermia. In addition, oiled feathers may reduce buoyancy, and in severe cases, a bird may lose the ability to fly, dive, swim, feed, or escape predators. Ingestion of even a small amount of crude oil can have negative effects including a decrease in fertilization, egg laying, and hatching rates. Small amounts of oil applied to the outside shell on an incubating egg causes high levels of mortality in a variety of birds (developing embryos obtain oxygen and disperse carbon dioxide through the porous shells). A slightly

oiled bird can deliver this small quantity of oil to its clutch. The primary causes of wildlife mortality and morbidity by crude oil exposure are the physical effects of oil exposure to skin, fur, and feathers (loss of water repellency and insulation) and the resulting hypothermia or hyperthermia, as well as irritation of skin, oral, ocular, respiratory, and gastrointestinal mucous membranes. In addition, exposure to oil may damage the reproductive system, liver, and kidneys. Suppression of the immune response and disruption or inhibition of red blood cell formation has also been noted.

Surface water contamination, if any, could affect fish, wildlife, or other aquatic and wetland resources at the contamination site or downstream. Potential effects to biological resources include attraction and ingestion by wildlife, direct toxicity to fish, or damage to plant roots or physiology if the contaminant is taken up by plants. Spilled fluids, or returned fluid mixed with oil, probably would not behave in the same way as oil (i.e., the fluids would generally be water soluble, whereas oil would not).

Groundwater contamination, if any, could affect these resources at natural seeps or springs where the groundwater source discharges to the surface. Or, groundwater contamination could affect biological resources if a groundwater well is used as a water source for wetlands, fisheries, or other wildlife benefits (e.g., a water source for managed wetlands or for wildlife drinking). The actual distance to seeps, springs, or wells that could be affected would be site-specific, dependent on the groundwater resource extent and flow characteristics.

Potential surface water and groundwater quality impacts are described in Section 4.7 (Groundwater Resources) and Section 4.8 (Surface Water Resources). The operator must comply with all applicable regulations regarding storage and handling of project-related contaminants.

Potential air quality impacts are described in Section 4.5 (Air Quality). Air pollution generated by oil and gas development activities may also affect the health of plants and wildlife. The operator must comply with all applicable regulations regarding air quality.

General Mitigation

Restrictions on certain activities to minimize impacts on biological resources, including wildlife habitat, would continue to be imposed. These include such protective measures as BMPs and Standard Operating Procedures (SOPs) (see Appendix D) for oil and gas development and the closure of sensitive areas to oil and gas development. All of these actions would benefit native populations and habitats at the local and landscape scales by eliminating or reducing negative impacts stemming from development.

Implementation of lease stipulations, BMPs, and SOPs, would avoid and minimize impacts to biological resources. Species-specific surveys and species avoidance and habitat protection and compensation measures would minimize impacts of oil and gas development activities on special status species.

4.11.3 Impacts of Alternative A (No Action)

See Section 4.10.3 for a discussion of the vegetation and habitat impacts of this alternative.

Alternative A has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major, depending on the extent and locations of surface disturbance for exploration and development. Field surveys to assess conditions of wildlife habitat and identify site-specific conditions of approval are completed at the project level and would provide a more detailed analysis. However, it is still possible to make informed decisions regarding impacts to wildlife habitat, based upon an understanding of impacts that are known to affect wildlife habitat in general, as discussed in Section 4.11.1 above.

Under Alternative A, measures to minimize impacts on wildlife and habitat would continue to be applied to oil and gas leases. Examples of these measures are oil and gas stipulations included in Appendix D of the RMP FEIS (BLM, 2006), and the BMPs and SOPs that are included in Appendix D of this RMPA.

The Endangered Species stipulation from the 2007 Hollister Field Office RMP would apply in all areas open to leasing. Although primarily directed at special status species, this stipulation also has the following requirements:

- Minimize impacts to biological resources.
- Take reasonable measures required by the BLM to protect resources.
- Specialized habitats such as riparian areas, vernal pools, other wetlands, floodplains, native perennial grasses, saltbrush, and oak woodlands would be avoided by surface disturbing activities when practical and feasible alternatives exist.

General mitigation as described in Section 4.11.2 would apply. Implementation of lease stipulations, BMPs, and SOPs (see Appendix D) would require site-specific analysis of potential impacts to wildlife and habitat resources, avoidance of sensitive areas where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A, all areas of the 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas leasing and would be issued (Section 2.6.2). The impacts from these leases would be the same as those discussed above for the Planning Area. The lease areas total approximately 17,600 acres. The Endangered Species stipulation from the 2007 Hollister Field Office RMP would apply in all areas of the leases. Impacts and mitigation would be the same as those for the Planning Area as a whole (Section 4.11.2).

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impact would occur.

4.11.4 Impacts of Alternative B

See Section 4.10.4 for a discussion of the vegetation and habitat impacts of this alternative.

Potential impacts within existing oil and gas fields and the surrounding 0.5-mile buffers would vary depending on site-specific factors, such as the wildlife and habitat present in the field, and the extent and location of oil and gas development disturbance. All the development would be limited to the existing oil and gas fields and surrounding 0.5-mile buffers. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources.

The impacts of Alternative B on wildlife and habitat are likely to be substantially reduced from existing conditions (i.e., the No Action Alternative) and Alternative F due to limitations on the locations of future wells. Alternative B would have up to 32 wells drilled, rather than 37, because it is limited to the existing oil and gas fields and 0.5-mile buffer area and the 5 exploratory wells would not be drilled. As a result, ground disturbance associated with Alternative B would be up to 179 acres.

Alternative B has the potential to result in short-term and temporary and long-term and permanent adverse impacts to approximately 22.45 to 179 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. Affected wildlife and habitat resources could be located within existing oil and gas fields, or within the surrounding 0.5-mile buffer areas.

Under Alternative B, measures to minimize impacts on wildlife and habitat would continue to be applied to oil and gas leases. Examples of these measures are oil and gas stipulations (Appendix C) and the BMPs and SOPs that are included in Appendix D of this RMPA. General mitigation as described in Section 4.11.2 would apply. Implementation of lease stipulations, BMPs, and SOPs (see Appendix D) would require site-specific analysis of potential impacts to wildlife and habitat resources, avoidance of sensitive areas where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement

Under Alternative B, a portion of the area of 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas development (Section 2.7.2 and Table 2-3) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development. Depending on location, some entire leases would be open for development, others would be all or nearly all closed. Many would have a mixture of open and closed areas. Of the total lease area of approximately 17,600 acres, 22 percent would be open and 78 percent would be closed. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. Impacts and mitigation within these leases would be to the same as those for the Planning Area as a whole (Section 4.11.2).

4.11.5 Impacts of Alternative C

See Section 4.10.5 for a discussion of the vegetation and habitat impacts of this alternative.

Potential impacts to wildlife and habitat would vary depending on site-specific factors, such as the type of native vegetation and habitat present and the extent and location of oil and gas development disturbance. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. NSO stipulations would avoid impacts to biological resources on critical habitat and special status split estate lands. Alternative C would close lands to leasing in core population areas of the giant kangaroo rat in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills (see Figure 2-3), and thus provides greater protections to this core population than Alternatives A or E.

Depending on where new oil and gas leases are located, the impacts of Alternative C on wildlife and habitat are likely to be reduced from existing conditions (i.e., the No Action Alternative) and Alternative F, but greater than Alternative B. In regard to BLM wildlife goals (see Section 4.11.1), with implementation of mitigation as described below, Alternative C has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. Wildlife and habitat resources could be located within existing oil and gas fields, or within the other areas identified as open and without the NSO stipulation under this alternative.

Under Alternative C, measures to minimize impacts on wildlife and habitat would continue to be applied to oil and gas leases. General mitigation as described in Section 4.11.2 would apply. Implementation of lease stipulations, BMPs, and SOPs (see Appendix D) would require site-specific analysis of potential impacts to wildlife and habitat resources, avoidance of sensitive areas where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement

Under Alternative C, the 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas development (Section 2.8.2) and subject to resulting impacts as discussed above for the Planning Area. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. Impacts and mitigation would be to the same as those for the Planning Area as a whole (Section 4.11.2).

4.11.6 Impacts of Alternative D

See Section 4.10.6 for a discussion of the vegetation and habitat impacts of this alternative.

Potential impacts would vary depending on site-specific factors, such as the type of wildlife and habitat present and the extent and location of oil and gas development disturbance. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. NSO stipulations would avoid impacts to biological resources on critical habitat and special status split estate lands. No oil and gas development would occur and there would be no impacts to biological resources in the Ciervo-Panoche Natural Area.

Depending on where new oil and gas leases are located, the impacts of Alternative D on wildlife and habitat are likely to be considerably reduced from existing conditions (i.e., the No Action Alternative) and Alternative F, and somewhat reduced from Alternative C, but greater than Alternative B. In regard to BLM wildlife goals (see Section 4.11.1), with implementation of mitigation as described below, Alternative D has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. Wildlife and habitat resources could be located within existing oil and gas fields or areas identified as open, and without the NSO stipulation under this alternative.

Under Alternative D, measures to minimize impacts on wildlife and habitat would continue to be applied to oil and gas leases. General mitigation as described in Section 4.11.2 would apply. Implementation of lease stipulations, BMPs, and SOPs (see Appendix D) would require site-specific analysis of potential impacts to wildlife and habitat resources, avoidance of sensitive areas where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement

Under Alternative D, a portion of the area of the 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas development (Section 2.10.2 and Table 2-3) and subject to resulting impacts as discussed above for the Planning Area. The remaining areas of the leases would be closed to oil and gas development. One lease would be entirely open; one would be entirely closed. Most leases would have a mixture of open and closed areas. All leases within the Ciervo-Panoche Natural Area would be closed. Of the total lease area of approximately 17,600 acres, approximately 25 percent would be open and 75 percent would be closed. Impacts and mitigation would be the same as those for the Planning Area as a whole (Section 4.11.2).

4.11.7 Impacts of Alternative E

See Section 4.10.7 for a discussion of the vegetation and habitat impacts of this alternative.

Potential impacts would vary depending on site-specific factors, such as the type of native vegetation and habitat present and the extent and location of oil and gas development disturbance. Impacts would occur only outside California DWR Bulletin 118 groundwater basins and sub-basins, and the other lands that would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, and Fort Ord National Monument). CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. NSO stipulations would avoid impacts to biological resources within specified Hydrologic Units (see Chapter 2) and within 0.25 miles of non-impaired, perennial surface waters and Wild and Scenic Rivers, and avoid and minimize impacts to these types of waters and associated wetlands.

Depending on where new oil and gas leases are located, the overall impacts of Alternative E on wildlife and habitat are likely to be reduced from existing conditions (i.e., the No Action Alternative) and Alternative F, but may be similar to or greater to impacts of Alternatives B, C, and D. Impacts of Alternative E on waters and associated wetlands are likely to be reduced from existing conditions and the

other alternatives. Alternative E has the potential to result in short-term and temporary and long-term and permanent adverse impacts that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. Wildlife and habitat resources could be located within existing oil and gas fields, or within open areas as identified in the alternative.

Under Alternative E, measures to minimize impacts on wildlife and habitat would continue to be applied to oil and gas leases. General mitigation as described in Section 4.11.2 would apply. Implementation of lease stipulations, BMPs, and SOPs (see Appendix D) would require site-specific analysis of potential impacts to wildlife and habitat resources, avoidance of sensitive areas where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement

Under Alternative E, a portion of the area of the 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas development (Section 2.11.2 and Table 2-3) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development or subject to NSO stipulations. Some entire leases would be open for development; one lease would be entirely within the NSO stipulation area. Most leases would have a mixture of open and closed areas and some would have NSO stipulations on part of the areas. Of the total lease area of approximately 17,600 acres, approximately 57 percent would be open, 2 percent would be closed, and 41 percent would be open with NSO. Impacts and mitigation would be similar to those for the Planning Area as a whole (Section 4.11.2).

4.11.8 Impacts of Alternative F

See Section 4.10.8 for a discussion of the vegetation impacts of this alternative.

Depending on where new oil and gas leases are located, the overall impacts of Alternative F on wildlife and habitat including waters and associated wetlands are likely to be similar to existing conditions (i.e., the No Action Alternative). However, the application of NSO stipulations targets selected sensitive areas to protect specific biological resources including vegetation and habitat, and reducing potential impacts to wildlife habitat. Alternative F has the potential to result in short-term and temporary and long-term and permanent adverse impacts that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. Wildlife and habitat resources could be located within existing oil and gas fields, or within open areas as identified in the alternative.

Under Alternative F, measures to minimize impacts on wildlife and habitat would continue to be applied to oil and gas leases. General mitigation as described in Section 4.11.2 would apply. Implementation of lease stipulations, BMPs, and SOPs (see Appendix D) would require site-specific analysis of potential impacts to wildlife and habitat resources, avoidance of sensitive areas where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement

Under Alternative F, the 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas development (Section 2.8.2) and subject to resulting impacts as discussed above for the Planning Area. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. Impacts and mitigation would be to the same as those for the Planning Area as a whole (Section 4.11.2).

4.12 Biological Resources – Special Status Species

4.12.1 Introduction

This section discusses impacts on special status plant and animal species, along with applicable mitigation. See Section 3.11 for a discussion of game and indicator species. Impacts and mitigation for non-special status wildlife species and their habitat are addressed in Section 4.11 of this document.

BLM Special Status Species Goals

The 2007 Hollister Field Office ROD (BLM, 2007) lists goals and objectives that define the desired future conditions for the special status species resource. The goal for management of special status species is to (1) protect and/or improve habitat necessary to recover populations of special status species, and (2) manage BLM surface land to maintain, restore, or enhance populations and habitat of special status fish, wildlife, and plant species.

To achieve the goal for management of special status species, the following objectives are established:

- Manage listed, proposed, or candidate threatened or endangered species to comply with the provisions of the Endangered Species Act (ESA).
- Manage special status plants consistent with BLM policy on Special Status Species Management (BLM Manual 6840, 6840.06, and 6600).
- Prevent the need for listing proposed, candidate, and sensitive species under the ESA
- Improve the condition of special status species and their habitats to a point where their special status recognition is no longer warranted.

Methods of Analysis

The analysis of direct and indirect effects is focused on species, populations, and habitats within the Planning Area. Direct impacts are the direct or immediate effects of an action on biological resources. Examples of direct impacts to special status animals and their habitat include mortality, injury, or displacement; interference with movement or migration; disruption of essential behaviors such as feeding, breeding, and sheltering; and disturbance from noise, light, or dust. Examples of direct impacts to special status plants are primarily limited to mortality or injury. Examples of indirect effects to native habitat of special status animals and plants include erosion, sedimentation, and introduction of non-native species that may compete with native species and cause habitat degradation. See Section 4.10.1 for a complete description of analysis methodology.

Generalized impacts from oil and gas development, including hydraulic fracturing and other well stimulation techniques, are common to all alternatives. These generalized impacts are presented below. The impact discussion presented for each alternative focuses on the particular impacts of that alternative and builds on the discussion of generalized impacts that would occur under all alternatives.

BLM is unable to quantify impacts to special status species from the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.12. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects to special status species from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when

wells are actually proposed to be drilled into the surface of the ground. Other incomplete or unavailable information includes the type(s) of development(s) and site-specific resource conditions because it's impossible for BLM to know how, where, or when leases would be developed.

Incomplete information includes undiscovered locations of special status species that may occur on public land and Federal mineral estate. A comprehensive survey of the Planning Area is not feasible, or reliable, because the timing, intensity, and/or location of future leasing and development activities is unknown. Therefore, BLM is unable to quantify effects on specific habitat types under the range of alternatives.

Nonetheless, it is still possible to make informed decisions regarding impacts to special status species, based upon an understanding of impacts that are known to affect species in general. For example, the evaluation of such impacts considers current resource conditions described in Chapter 3.12, and the regulatory framework described in Appendix J.

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of federal minerals in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99%) of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects on biological resources in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

Assumptions

Impacts to wildlife and habitat are discussed in Section 4.11. The effects of each alternative to special status species habitat would be generally similar to those discussed in Section 4.11, as would applicable mitigation. The assumptions used for biological effects analysis in general are listed in Section 4.10, Vegetation. Additional assumptions used in this impact analysis include the following:

- Species-specific surveys and species avoidance and habitat protection measures would result in land use authorizations that minimize impacts on these special status species. Examples of these measures are provided below and in Appendix D – Best Management Practices and Standard Operating Procedures.
- Disturbance of Federally listed plant populations would be minimized.
- Although there may be localized effects on special status species, adjacent BLM surface lands would continue to support populations of these species, which would contribute to their conservation and recovery.
- All new oil, gas, and geothermal leases would be issued with stipulations to protect special status species and critical habitat. These stipulations would allow the BLM to move, delay, and even prohibit surface-disturbing activities on all or a portion of the lease, if necessary, to reduce impacts on biological resources to an acceptable level.
- For federally listed species, surface disturbance will be prohibited if the USFWS Endangered Species Act Section 7 consultation concludes that the proposed action is inconsistent with the recovery needs of the species as identified in an approved USFWS Recovery Plan (see Appendix C, Statewide Stipulations).
- Other actions to conserve, restore, and enhance special status species habitat would also continue to be implemented. These proactive measures include direction to retain and acquire important native habitat, especially for federally listed species; to implement recovery plans and secure areas important for recovery (e.g., compensation lands); to maintain, enhance, and restore native habitat and native populations, including riparian and sensitive species; to maintain linkage between areas of natural habitat;

to improve the knowledge base of the species and lands under BLM management; and to manage all public lands appropriately.

- The management of special areas with high biological value as ACECs would help protect important biological resources from human activities and would result in the long-term maintenance of high-quality habitat across the landscapes where BLM surface lands occur.
- Within the Planning Area, most of the oil and gas activity is projected to occur near existing oil fields in southern Monterey, western Fresno, and southeastern San Benito Counties. Between 0 and 37 wells are forecast to be drilled per year. The RFD Scenario estimates that between 179 and 206 acres of surface disturbance would occur as a result of new Federal oil and gas leases. Only a portion of the disturbance would be within habitat.

Management Actions

The ROD (BLM, 2007) also lists a number of land use management actions to address identified issues, management concerns, and current and projected future uses of the lands administered by the CCFO in the Planning Area. The management actions that may be relevant to oil and gas development include, but are not limited to the following. The applicable areas for each management action are noted in parentheses at the end of each description.

- **SSS-COM2.** Monitor and maintain upland habitat for the California tiger salamander (all management areas).
- **SSS-C1.** Maintain, restore, or enhance special status species habitat (all management areas).
- **SSS-C2.** Limit proposed new surface-disturbing activities within occupied or potential habitat for special status species and significant plant communities. Limit long-term disturbances in potential habitat (all management areas).
- **SSS-C3.** Mitigate or relocate activities that disturb, alter, or interrupt hydrologic or ecological processes that support special status species (all management areas).
- **SSS-COM3.** Protect ponds, wetlands, or riparian areas known to support or that could potentially support California tiger salamander, red-legged frog, or California linderiella to maintain natural corridors between pools/wetlands and upland habitat so that continuous native plant coverage allows adequate movement of these species (Central Coast Management Area).

Lease Stipulations

Lease stipulations are used to protect resource values. See discussion in Section 2.5.1. Controlled Surface Use (CSU) stipulations mean that use and occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operation constraints that may modify the lease rights. The specific constraints would be applied based on the biological resources present and may include provisions to address protected species; sensitive species; critical habitat; raptors; or priority species, plant communities, and habitat. No Surface Occupancy (NSO) stipulations prohibit any surface disturbance on the lease land.

BMPs and SOPs

The Best Management Practices (BMPs) and Standard Operating Procedures (SOPs) for this RMPA (Appendix D: Sections 1.2 through 1.6, and 1.8) include a number of measures that would reduce impacts to wildlife. The topics addressed are briefly summarized in Sections 4.10.2 and 4.11.2; additional topics applicable to special status species are listed below; see Appendix D for complete text of measures.

- Minimize habitat disturbance and reduce the potential for take of federally listed species.
- Minimize activities during evening hours.

- Immediately cease project activities that are likely to cause the allowed extent of take to be exceeded.
- Extend protective measures for federally listed species to candidate and proposed species.
- Conduct surveys for federally listed species and important habitat features for listed species.

There are also species-specific BMPs and SOPs measures for certain special status species; see Appendix D for additional details and complete text of measures. Project areas include surrounding buffers of varying sizes.

4.12.2 Impacts Common to All Alternatives

Under the Reasonably Foreseeable Development (RFD) Scenario for oil and gas development on Federal mineral estate in the Planning Area, within the next 15 to 20 years there is expected to be zero to 32 new development wells, most likely within the existing Coalinga, San Ardo, Lynch Canyon, and Jacalitos fields, but potentially occurring anywhere that is open to oil and gas leasing; 3 to 5 exploratory wells outside existing fields, most if not all in areas of high oil and gas occurrence potential; and geophysical exploration. Surface disturbance of 22 to 206 acres is expected to be associated with this development. A portion of this disturbance may be within previously disturbed areas. Areas of high oil and gas occurrence potential (Figure 4 of the RFD Scenario, Appendix B) generally correspond to identified oil and gas plays within the San Joaquin and Salinas Basins. See Appendix B for details.

Oil and gas leasing would have short-term and long-term direct and indirect effects on special status species if new or existing leases are developed. Geophysical exploration would result in many of the same impacts as other oil and gas activities, but generally results in short-term impacts on biological resources.

Oil and gas development activities could affect special status animals or plants, including federally listed endangered or threatened species and BLM sensitive species, depending on the specific location of the activities and their on-site and off-site habitat effects. See Table 3.12-1 for the definition of special status species, as used in this document.

Direct or indirect impacts to special status wildlife include take, mortality, injury, loss or degradation of occupied habitat, or disturbance that may affect normal behavior patterns such as breeding, feeding, sheltering, migration, or dispersal. Wildlife, including special status wildlife, could be exposed to hazards such as vehicle strikes, nest disturbance, entrapment, collision, electrocution, and hazardous materials.

Examples of adverse effects to endangered, rare, or threatened plants include grading or mowing plants during site preparation or other ground-disturbing activities; soil compaction or other habitat effects that may prevent seeds from germinating or becoming established; alterations to upstream or downstream site hydrology, leading to alteration of special-status plant habitat (e.g., removing surface or soil water source, or causing inundation of an upland species occurrence); introduction or spread of invasive species that may compete with rare plants or alter natural processes; or introduction of substantial dust from project activities, interfering with plant physiology.

Other potential impacts to special status species would be similar to those discussed in Sections 4.10 and 4.11. Additional impact information for certain special status species is provided below.

California condor

The Planning Area is within the range of the California condor. Condors can be harmed by ingesting oilfield materials, including oil, vehicle coolant, chemicals, and trash. Condors can collide with structures and power lines. Habituation to humans can increase the likelihood of human-condor interactions. Noise from activities can disrupt roosting and nesting behavior, and place condor chicks at risk. Condors can become coated with oil from well cellars, leaks, and spills or become entangled in equipment or fences. While these impacts may occur at a local scale, they may impact condor populations across the larger landscape where

these birds occur. The impacts may be short-term or long-term depending on the extent of impacts and condor population levels and population trends.

San Joaquin Valley species

The Planning Area includes portions of the San Joaquin Valley. Some of the federally listed species in this area are San Joaquin woolly threads, California jewelflower, San Joaquin kit fox, blunt-nosed leopard lizard, giant kangaroo rat, Tipton kangaroo rat, and San Joaquin antelope squirrel. BLM sensitive plant species (CRPR 1B) are numerous and include Hoover's eriastrum, Mason neststraw, San Benito onion, Lost Hills crownscale, Hall's tarplant, Pale yellow layia, Showy madia, Recurved larkspur, and Panoche peppergrass.

Oil and gas development affects special status species by habitat loss due to vegetation removal and grading for well pads, roads, and other facilities. Noise and vibration, venting of toxic and noxious gases, and release of petroleum products and wastewaters result in habitat degradation. Injury and mortality may result from vehicle strikes, entrapment, and drowning in oil sumps or wastewater ponds.

Ecological communities in San Joaquin Valley saltbush scrub may remain relatively intact with low to medium levels of oil field development. At higher levels of development, greater structural diversity due to facilities and plantings, greater amount of edge habitat, and the availability of water create habitat that is occupied by common, opportunistic species rather than special status endemic species (Fiehler and Cypher, 2011). Low and moderate levels of development could sustain suitable habitat for San Joaquin kit fox, and other special status species, as long as suitable mitigation policies are observed, while high-density development areas become unsuitable or are largely avoided (Fiehler and Cypher, 2011; USFWS, 1998).

General Mitigation

Restrictions on certain activities to minimize impacts on biological resources, including special status species, would continue to be imposed. These include such protective measures as BMPs and SOPs (see Appendix D) for oil and gas development and the closure of sensitive areas to oil and gas development. For example, site-specific timing restrictions could be made on a case by case basis, dependent on the potential for California condor seasonal or diurnal activity in the vicinity of any given site. Activity restrictions, where appropriate, may reduce the likelihood of human/condor encounters, or the likelihood of a condor landing on working equipment. All of these actions would benefit native populations and habitats at the local and landscape scales by eliminating or reducing negative impacts stemming from development.

Implementation of lease stipulations, BMPs, and SOPs, and additional mitigation would avoid and minimize impacts to biological resources. Species-specific surveys and species avoidance and habitat protection and compensation measures would minimize impacts of oil and gas development activities on special status species.

4.12.3 Impacts of Alternative A (No Action)

See Sections 4.10.3 and 4.11.3 for discussion of the vegetation and wildlife habitat impacts of this alternative.

Alternative A has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major, depending on the extent and locations of surface disturbance for exploration and development. For example, new development on disturbed sites within developed oil and gas fields that are not within habitat occupied by special status species would be minor, whereas new surface disturbance in occupied habitat could have major effects to special status species. Site-specific analysis would be required to determine actual impacts. However, lease stipulations (and mitigation measures at the project level) are designed to avoid or minimize potential effects on these resources.

Under Alternative A, measures to minimize impacts on wildlife and habitat would continue to be applied to oil and gas leases. Examples of these measures are oil and gas stipulations included in Appendix D of the RMP FEIS (BLM, 2006) and the BMPs and SOPs in Appendix D of this RMPA.

The Endangered Species stipulation from the 2007 HFO RMP would apply in all areas open to leasing. Although primarily directed at special status species, this stipulation also has the following requirements:

- Minimize impacts to biological resources.
- Take reasonable measures required by the BLM to protect resources.
- Specialized, sensitive hydrologic habitats such as wetlands, riparian zones, and vernal pools and sensitive edaphic habitats such as serpentine, vertic clay soils, and sand dunes. be avoided by surface disturbing activities when practical and feasible alternatives exist.

General mitigation as described in Section 4.12.2 would apply. Implementation of lease stipulations, BMPs, and SOPs (see Appendix D) would require site-specific analysis of potential impacts to special status species, avoidance of occupied habitat where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to special status species.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A, all areas of the 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas leasing and development and would be issued (Section 2.6.2), as such the leases would be subject to resulting impacts discussed above for the Planning Area. The lease areas total approximately 17,600 acres. A list of the special status species known to occur within one mile of these leased areas is included in Section 3.12.4. The Endangered Species stipulation from the 2007 HFO RMP would apply in all areas of the leases. Impacts and mitigation would be the same as those for the Planning Area as a whole (Section 4.12.2).

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impact would occur.

4.12.4 Impacts of Alternative B

See Sections 4.10.4 and 4.11.4 for discussion of the vegetation and wildlife habitat impacts of this alternative.

Potential impacts within existing oil and gas fields and the surrounding 0.5-mile buffers would vary depending on site-specific factors, such as the special status species present in the field, and the extent and location of oil and gas development disturbance. All the development would be limited to the existing oil and gas fields and surrounding 0.5-mile buffers. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources.

The impacts of Alternative B on special status species are likely to be substantially reduced from existing conditions (i.e., the No Action Alternative) and Alternative F due to limitations on the locations of future wells. Alternative B would have up to 32 wells drilled, rather than 37, because it is limited to the existing oil and gas fields and 0.5-mile buffer area and the 5 exploratory wells would not be drilled. As a result, ground disturbance associated with Alternative B would be up to 179 acres.

Alternative B has the potential to result in short-term and temporary and long-term and permanent adverse impacts for 22 to 179 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. For example, new development on disturbed sites within developed oil and gas fields that are not within habitat occupied by special status species would be

minor, whereas new surface disturbance in occupied habitat could have major effects to special status species. However, lease stipulations (and mitigation measures at the project-level) are designed to avoid or minimize potential effects on these resources. Affected special status species and associated habitat could be located within existing oil and gas fields, or within the surrounding 0.5-mile buffer areas. Site-specific analysis would be required to determine actual impacts.

Under Alternative B, measures to minimize impacts on special status species would continue to be applied to oil and gas leases. Examples of these measures are oil and gas stipulations (Appendix C of this RMPA) and the BMPs and SOPs that are included in Appendix D of this RMPA.

General mitigation as described in Section 4.12.2 would apply. Implementation of lease stipulations, BMPs, and SOPs would require site-specific analysis of potential impacts to special status species, avoidance of occupied habitat where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to special status species.

Leases Subject to Settlement Agreement

Under Alternative B, a portion of the area of the 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas leasing and development (Section 2.7.2 and Table 2-3) and subject to resulting impacts as discussed above for the Planning Area. The remaining areas of the leases would be closed to oil and gas development. Depending on location, some entire leases would be open for development, others would be all or nearly all closed. Many would have a mixture of open and closed areas. Of the total lease area of approximately 17,600 acres, approximately 22 percent would be open and 78 percent would be closed. A list of the special status species known to occur within one mile of these leased areas is included in Section 3.12.4. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. Impacts and mitigation within these leases would be the same as those for the Planning Area as a whole (Section 4.12.2).

4.12.5 Impacts of Alternative C

See Sections 4.10.5 and 4.11.5 for discussion of the vegetation and wildlife habitat impacts of this alternative.

Potential impacts to special status species would vary depending on site-specific factors, such as the special status species present and the extent and location of oil and gas development disturbance. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. NSO stipulations would avoid impacts to biological resources on critical habitat and special status split estate lands.

Depending on where new oil and gas leases are located, the impacts of Alternative C on wildlife and habitat are likely to be reduced from existing conditions (i.e., the No Action Alternative) and Alternative F but greater than Alternative B. However, approximately 35,400 acres would be closed within or in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills. The areas that would be closed to leasing within Panoche, Griswold, Tumey, and Ciervo Hills areas were identified for the protection and recovery of a core population of the federally listed endangered giant kangaroo rat as well as for protection and recovery of the federally listed endangered San Joaquin kit fox. These areas contain these listed species, and the closure areas in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills would maintain connectivity and movement corridors within suitable habitat for the San Joaquin kit fox. Additionally, portions of these areas contain the federally listed endangered blunt-nosed leopard lizard and federally listed endangered San Joaquin woolly threads.

Alternative C has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. For example, new development on disturbed sites within developed oil and gas fields that are not within habitat occupied by special status species would be

minor, whereas new surface disturbance in occupied habitat could have major effects to special status species. However, lease stipulations (and mitigation measures at the project level) are designed to avoid or minimize potential effects on these resources. Special status species and associated habitat could be located within existing oil and gas fields, or within the other areas identified as open and without the NSO stipulation under this alternative. Site-specific analysis would be required to determine actual impacts.

Under Alternative C, measures to minimize impacts on special status species would continue to be applied to oil and gas leases.

General mitigation as described in Section 4.12.2 would apply. Implementation of lease stipulations, BMPs, and SOPs would require site-specific analysis of potential impacts to special status species, avoidance of occupied habitat where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to special status species.

Leases Subject to Settlement Agreement

Under Alternative C, the 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas leasing and development (Section 2.8.2) and subject to resulting impacts as discussed above for the Planning Area. A list of the special status species known to occur within one mile of these leased areas is included in Section 3.12.4. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. Impacts and mitigation would be to the same as those for the Planning Area as a whole (Section 4.12.2).

4.12.6 Impacts of Alternative D

See Sections 4.10.6 and 4.11.6 for discussion of the vegetation and wildlife habitat impacts of this alternative.

Potential impacts would vary depending on site-specific factors, such as the special status species present and the extent and location of oil and gas development disturbance. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. NSO stipulations would avoid impacts to biological resources in ACECs and R&PP leases. Under Alternative D, closure of the Ciervo-Panoche Natural Area to oil and gas development would avoid impacts to the special status species found in that area, including San Joaquin woolly threads, San Joaquin kit fox, giant kangaroo rat, and blunt-nosed leopard lizard.

Depending on where new oil and gas leases are located, the impacts of Alternative D on special status species are likely to be considerably reduced from existing conditions (i.e., the No Action Alternative) and Alternative F, and somewhat reduced from Alternative C, but greater than Alternative B. In regard to BLM special status species goals (see Section 4.12.1), with implementation of mitigation as described below, Alternative D has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. For example, new development on disturbed sites within developed oil and gas fields that are not within habitat occupied by special status species would be minor, whereas new surface disturbance in occupied habitat could have major effects to special status species. However, lease stipulations (and mitigation measures at the project-level) are designed to avoid or minimize potential effects on these resources. These resources could be located within existing oil and gas fields, or within the other areas identified as open and without the NSO stipulation under this alternative. Site-specific analysis would be required to determine actual impacts.

Under Alternative D, measures to minimize impacts on special status species would continue to be applied to oil and gas leases. General mitigation as described in Section 4.12.2 would apply. Implementation of lease stipulations, BMPs, and SOPs (see Appendix D) would require site-specific analysis of potential

impacts to special status species, avoidance of occupied habitat where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to special status species.

Leases Subject to Settlement Agreement

Under Alternative D, a portion of the area of the 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas leasing and development (Section 2.10.2 and Table 2-3) and subject to resulting impacts as discussed above for the Planning Area. The remaining areas of the leases would be closed to oil and gas development. A list of the special status species known to occur within one mile of these leased areas is included in Section 3.12.4. Most leases would have a mixture of open and closed areas. Of the total lease area of approximately 17,600 acres, open areas would be approximately 25 percent and closed areas 75 percent. Impacts and mitigation would be the same as those for the Planning Area as a whole (Section 4.12.2).

4.12.7 Impacts of Alternative E

See Sections 4.10.7 and 4.11.7 for discussion of the vegetation and wildlife habitat impacts of this alternative.

Potential impacts would vary depending on site-specific factors, such as the special status species present and the extent and location of oil and gas development disturbance. Impacts would occur only outside California DWR Bulletin 118 groundwater basins and sub-basins and the other lands that would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, and Fort Ord National Monument). CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. NSO stipulations would avoid impacts to biological resources within 0.25 miles of non-impaired, perennial surface waters and Wild and Scenic Rivers and specified Hydrologic Units (see Chapter 2), and avoid and minimize impacts to these types of waters and associated wetlands.

Depending on where new oil and gas leases are located, the overall impacts of Alternative E on special status species are likely to be reduced from existing conditions (i.e., the No Action Alternative) and Alternative F, but may be similar to or greater to impacts of Alternatives B, C, and D. Impacts of Alternative E on special status species associated with waters and wetlands are likely to be reduced from existing conditions and the other alternatives. In regard to BLM special status species goals (see Section 4.12.1), with implementation of mitigation as described below, Alternative E has the potential to result in short-term and temporary and long-term and permanent adverse impacts that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. For example, new development on disturbed sites within developed oil and gas fields that are not within habitat occupied by special status species would be minor, whereas new surface disturbance in occupied habitat could have major effects to special status species. However, lease stipulations (and mitigation measures at the project level) are designed to avoid or minimize potential effects on these resources. Special status species and associated habitat could be located within existing oil and gas fields, or within open areas as identified in the alternative. Site-specific analysis would be required to determine actual impacts.

Under Alternative E, measures to minimize impacts to special status species would continue to be applied to oil and gas leases. General mitigation as described in Section 4.12.2 would apply. Implementation of lease stipulations, BMPs, and SOPs (see Appendix D) would require site-specific analysis of potential impacts to special status species, avoidance of occupied habitat where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to special status species.

Leases Subject to Settlement Agreement

Under Alternative E, a portion of the area of the 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas leasing and development (Section 2.11.2 and Table 2-3) and subject to resulting impacts as discussed above for the Planning Area. The remaining areas of the leases

would be closed to oil and gas development or subject to NSO stipulations. A list of the special status species known to occur within one mile of these leased areas is included in Section 3.12.4. Some entire leases would be open for development; one lease would be entirely within the NSO stipulation area. Most leases would have a mixture of open and closed areas and some would have NSO stipulations on part of the areas. Of the total lease area, open areas would be approximately 66 percent, closed areas 2 percent, and NSO areas 32 percent. Impacts and mitigation would be similar to those for the Planning Area as a whole (Section 4.12.2).

4.12.8 Impacts of Alternative F

See Sections 4.10.8 and 4.11.8 for discussion of the vegetation and wildlife habitat impacts of this alternative.

Depending on where new oil and gas leases are located, the overall impacts of Alternative F on special-status species are likely to be similar to existing conditions (i.e., the No Action Alternative). However, the application of NSO stipulations targets selected sensitive areas to protect specific biological resources including vegetation and habitat, and reducing potential impacts to special-status species. Alternative F has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major, depending on the extent and locations of surface disturbance for exploration and development. For example, new development on disturbed sites within developed oil and gas fields that are not within habitat occupied by special status species would be minor, whereas new surface disturbance in occupied habitat could have major effects to special status species. Site-specific analysis would be required to determine actual impacts. However, lease stipulations (and mitigation measures at the project level) are designed to avoid or minimize potential effects on these resources.

Under Alternative F, measures to minimize impacts on special-status species would continue to be applied to oil and gas leases. General mitigation as described in Section 4.12.2 would apply. Implementation of lease stipulations, BMPs, and SOPs (see Appendix D) would require site-specific analysis of potential impacts to biological resources, avoidance of sensitive areas where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to special status species.

Leases Subject to Settlement Agreement

Under Alternative F the 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas leasing and development (Section 2.8.2) and subject to resulting impacts as discussed above for the Planning Area. A list of the special status species known to occur within one mile of these leased areas is included in Section 3.12.4. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. Impacts and mitigation would be to the same as those for the Planning Area as a whole (Section 4.12.2).

4.13 Visual Resource Management

This section describes the types of potential impacts Alternatives A through F could have on visual resources in the BLM Central Coast Field Office Planning Area (Planning Area), and it addresses the types of mitigation that could be implemented to lessen the degree of the impacts, where applicable.

4.13.1 Introduction

Approach to Impact Assessment

A visual resource impact analysis involves determining whether the potential visual impacts from proposed surface-disturbing activities or developments meet the class management objectives established for the area or whether design adjustments may be required.

The impact analysis is based on the following assumptions:

- The public would continue to value landscape appearance as a resource to be managed in the Planning Area.
- The machinery and infrastructure associated with oil and gas activities would remain relatively unchanged over the life of the RMPA.
- Recreational use would continue to increase over the life of the RMPA, increasing the value of unmodified landscapes.
- All surface disturbance associated with oil and gas development analyzed in this RMPA/EIS would occur in one area, thereby maximizing the potential visual impacts and presenting the full buildout of the RFD scenario.
- Areas open to oil and gas leasing (with no stipulations and based on the current natural conditions of the areas managed as VRM Class I, II, III, and IV; see Section 3.13.4):
  - *would be inconsistent* with the VRM Class I objective;
  - *would likely be inconsistent* with VRM Class II objective (without design adjustments);
  - *may be inconsistent* with VRM Class III objective (without design adjustments); and
  - *would be consistent* with the VRM Class IV objective.
- Areas open to oil and gas leasing with Controlled Surface Use (CSU) stipulations (and based on the current natural conditions of the areas managed as VRM Class I, II, and III; see Section 3.13.4):
  - *would likely be inconsistent* with the VRM Class I objective;
  - *may not be consistent* with VRM Class II and III objectives (without design adjustments); and
  - *would be consistent* with the VRM Class IV objective.

  CSU stipulations are intended to be used when fluid mineral occupancy and use are generally allowed on all or portions of the lease year-round, but because of special values, or resource concerns, lease activities must be strictly controlled.
- Areas open to oil and gas leasing with No Surface Occupancy (NSO) stipulations *would be consistent* with all VRM class objectives since there would be no development allowed on the surface. NSO stipulations are intended for use only when other stipulations are determined insufficient to adequately protect the public interest.
- Areas closed to oil and gas leasing *would be consistent* with all VRM class objectives because there would be no visual change to the landscape.

Impacts to visual resources are considered major if they substantially change or degrade the character of the landscape as seen from sensitive viewsheds, or if the allowable modifications conflict with VRM

objectives. While topography can allow for some landscape modifications, many types of disturbance, such as roads and built structures, can dominate the landscape depending on their size, distance, topographic position, presence or absence of screening, and contrast with surrounding conditions. Viewsheds deemed to be of high value are those that have high scenic quality, such as the Ventana Wilderness near U.S. Highway 101 or the Joaquin Ridge/Rocks area west of I-5, or high visual sensitivity due to a large amount of public interest and viewing.

The visual resources analysis in this RMPA/EIS evaluates six oil and gas alternatives and their potential impacts on visual resources in the Planning Area. This visual resources analysis evaluates each alternative relative to the VRM class objectives outlined in the Proposed RMPA/Final EIS (BLM, 2006) and Record of Decision for the Resource Management Plan for the Southern Diablo Mountain Range and Central Coast of California (RMP; BLM, 2007; see Table 3.13-1). Those objectives are listed in this report in Appendix J, Table J-5.

Types of Impacts

Constructing oil and gas facilities would promote the types of visible landscape contrasts associated with that industry. The industrial machinery and equipment necessary for clearing vegetation, grading landforms, and drilling wells during the construction and maintenance phases of leasable oil and gas operations would result in direct, short-term contrasts of an episodic and transient nature. Movement and activity of construction and drilling machinery would draw the observer's attention to form and color contrasts. Construction equipment and activities would promote the occurrence of traffic and dust resulting in short-term landscape contrasts. The actions of well pad and road construction would result in long-term contrasts in form, line, color, and texture. Form and color contrasts would diminish somewhat as areas transition from construction to the operational phase, largely due to the absence of large equipment movement and activity.

Landscape contrast could be long-term during operational/production phases because leased areas would harbor structures and equipment that would introduce or exacerbate industrial character and create contrasts in form, texture, and possibly color. Equipment likely to appear in these areas over the long term could include tanks, compressor stations, valves, pipes, vents, and enclosed control rooms. Well pads and other areas cleared of vegetation could result in localized and moderate contrasts in line, color, and texture over the long term. Roads, pipeline corridors, and other linear areas cleared of vegetation would result in contrasts in line, color, and texture that could result in long-term land scarring.

Evaporation ponds near oil and gas well pads may draw the eye of the casual observer and could increase landscape contrasts in different ways depending on the relationship of water and vegetation surrounding the ponds. Surface disturbance would be visible when the water levels drop below a pond's capacity and vegetation does not mask contrasts in color and texture. Color contrasts could also be visible at evaporation ponds where salts and minerals accumulate on the substrate and the ponds are empty.

Production facilities could be illuminated at night resulting in nighttime color contrasts over the long term and a reduction in night-sky visibility and naturalness. The magnitude of these contrasts would depend on several factors including time of day, season, density, and extent of the oil and gas production facilities.

Making lands available for oil and gas leasing does not involve any direct effects to scenic quality, as leasing does not authorize surface disturbing activities. Future oil and gas development would be subject to site-specific environmental analysis and permitting requirements. No alternatives propose oil and gas development so this analysis relies on the RFD that projects future potential surface disturbing activities in support of oil and gas development. Potential future development of oil and gas leases might result in impacts to scenic quality.

However, the BLM is unable to quantify impacts to visual resources from the range of alternatives because the exact timing and/or location of future leasing and development activities is speculative. Therefore, the

evaluation of such impacts is based on the RFD Scenario and current resource conditions described in Section 3.13.

The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects to visual resources from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground. Other incomplete or unavailable information includes the type(s) of development(s) and site-specific resource conditions because it's impossible for BLM to know how, where, or when leases would be developed.

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of federal minerals in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99 percent) of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. The CCST report also indicates the majority of oil and gas activity in the planning area entails conventional well drilling. The CCST report suggests the potential for future operations to include enhanced well stimulation techniques is low because previous attempts to extract resources using hydraulic fracturing have not been productive or economical. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects on visual resources in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

4.13.2 Impacts Common to All Alternatives

The Reasonably Foreseeable Development (RFD) Scenario (i.e., between zero and 37 development and exploratory wells with approximately 206 acres of surface disturbance over the next 15 to 20 years on Federal mineral estate in the Planning Area) would occur under all of the alternatives except for Alternative B, which would include between zero and 32 development wells within the boundaries of oil and gas fields plus a 0.5-mile buffer defined by DOGGR. The full buildout of the RFD scenario (i.e., 37 wells and 206 acres of surface disturbance) is assumed for each alternative herein, except for Alternative B, which assumes 32 wells (179 acres of disturbance), and it is assumed that all of this disturbance would occur in one area, thereby maximizing the potential visual impacts.

For all alternatives, all oil and gas leasing in areas designated VRM Class IV would be consistent with the VRM Class IV objective. Therefore, these leases are not addressed in the following sections.

For all alternatives, wilderness study areas and national monuments would be closed to oil and gas leasing, which would be consistent with the VRM Class I objective. Furthermore, the Clear Creek Serpentine ACEC is a discretionary closure that is not open to oil and gas leasing under any alternative.

Leases Subject to Settlement Agreement

For all alternatives, leases subject to the Hollister I and II settlement occur in the Williams Hill area of the Salinas MA (VRM Class IV) (Leases CACA 052960, 052959, 053825, 053824, 053827, 053826), in the Griswold-Tumey Hills area (VRM Class III) of the San Joaquin MA (CACA Leases 053858, 053829, 053830, 053833, and 053834), and on lands designated VRM Class IV south of Griswold Hills in the San Joaquin MA (Leases CACA 053835, 053832, and 053831). The leases subject to the settlement agreement that are located in the Williams Hill area of the Salinas MA and in the San Joaquin MA south of Griswold Hills would be consistent with the VRM Class IV objective.

For all alternatives, there are no leases subject to the settlement agreement located in the Central Coast and San Benito MAs.

4.13.3 Impacts of Alternative A (No Action)

Alternative A would be developed according to the 2015 RFD Scenario but would continue current visual resource management goals, objectives, and management (see Table 3.13-1) under the existing 2007 RMP (BLM, 2007). Alternative A impacts to visual resources managed by the BLM as VRM Class I, II, and III in the Planning Area are analyzed below. Alternative A would include: (1) areas open to oil and gas leasing, (2) areas open to leasing with NSO stipulations, and (3) areas closed to leasing (Figure 2-1) as addressed below by MA.

Mitigation Measures VR-1 through VR-10 in Appendix C include the types of measures that could be implemented to lessen the degree of potential adverse visual impacts from oil and gas leases associated with Alternative A. These measures incorporate the fundamental principles in the VRM system upon which the VRM BMPs are based and include proper site selection, minimizing visual contrast, reducing unnecessary surface disturbance, exercising proper color selection, and restoration of impacted landscapes. In addition, Mitigation Measure AQ-1 would control or suppress fugitive dust.

Central Coast Management Area

Fort Ord National Monument, which is designated VRM Class II, would be closed to oil and gas leasing under Alternative A (Figure 2-1); this would be *consistent* with the VRM Class II objective.

San Joaquin Management Area

The Panoche, Griswold, Tumey, and Ciervo Hills and Coalinga Mineral Springs areas of the San Joaquin MA are designated VRM Class III. Under Alternative A, these areas would contain: (1) areas open to oil and gas leasing with no stipulations and (2) areas open to leasing with NSO stipulations (Figure 2-1). Oil and gas leasing with no stipulations has the potential to cause a high level of visual change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed) unless design adjustments are included. Leases with NSO stipulations would result in no visually apparent surface disturbance, which would be *consistent* with the VRM Class III objective.

The Joaquin Rocks area is designated VRM Class II. Under Alternative A, this area would contain: (1) areas open to oil and gas leasing with no stipulations and (2) areas open to leasing with NSO stipulations (Figure 2-1). Oil and gas leasing with no stipulations has potential to create moderate to high levels of visual change and result in adverse visual impacts that would *likely be inconsistent* with the VRM Class II objective (only a low level of change allowed) unless design adjustments are included. Leases with NSO stipulations would result in no visually apparent surface disturbance, which would be *consistent* with the VRM Class II objective.

Salinas Management Area

The Sierra de Salinas area of the Salinas MA is designated VRM Class III. Under Alternative A, this area would contain areas open to oil and gas leasing with no stipulations (Figure 2-1). These leases have potential to create a high level of visual change and result in adverse visual impacts. Therefore, they *may be inconsistent* with the VRM Class III objective (moderate level of change allowed) unless design adjustments are included.

Also, under Alternative A, the Ventana (and Silver Peak) Wilderness Area and the Bear Mountain WSA would be closed to oil and gas leasing under Alternative A (Figure 2-1); this would be *consistent* with the VRM Class I objective.

San Benito Management Area

The Hernandez Valley, Call Mountain, and Laguna Mountain areas of the San Benito MA are designated VRM Class III. Under Alternative A, these areas would contain areas open to oil and gas leasing with no stipulations (Figure 2-1), which has the potential create a high level of visual change and, therefore, result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed) unless design adjustments are included.

Leases Subject to Settlement Agreement – Subalternative 1

Leases CACA 053828, 053829, 053830, 053833, and 053834 are located in areas designated VRM Class III in the Griswold Hills area of the San Joaquin MA (Figure 2-1). Under Alternative A, Subalternative 1, this oil and gas leasing has the potential to create a high level of change and result in adverse visual impacts. Therefore, it *may be inconsistent* with the VRM Class III objective unless design adjustments are included. The remaining 9 leases would be would be *consistent* with the VRM Class IV objective as discussed in Section 4.13.2 (Impacts Common to All Alternatives).

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impact would occur.

4.13.4 Impacts of Alternative B

Alternative B only includes: (1) areas that would be open to oil and gas leasing with CSU stipulations and (2) areas that would be closed to leasing (Figure 2-2).

Mitigation Measures VR-1 through VR-10 and AQ-1 in Appendix C include the types of measures that could be implemented to lessen the degree of potential adverse visual impacts from oil and gas leases associated with Alternative B.

Central Coast Management Area

The Fort Ord National Monument is closed to oil and gas leasing under Alternative B (Figure 2-2); this would be *consistent* with the VRM Class I objective.

San Joaquin Management Area

The Panoche Hills, Ciervo Hills, and Coalinga Mineral Springs areas of the San Joaquin MA would be closed to oil and gas leasing (Figure 2-2), which would be *consistent* with the VRM Class III objective (moderate level of change allowed) for these areas. The Griswold Hills area (also VRM Class III) would contain areas both closed to oil and gas leasing and open to leasing with CSU stipulations (Figure 2-2). Areas closed to leasing would be *consistent* with the VRM Class III objective. Even with CSU stipulations, oil and gas leasing has the potential to cause a high level of visual change and result in adverse visual impacts. Therefore, it *may be inconsistent* with the VRM Class III objective unless design adjustments are included.

The Joaquin Rocks area is designated VRM Class II. Under Alternative B, a portion of this area would be open to oil and gas leasing with CSU stipulations (Figure 2-2). Even with CSU stipulations, however, the leases have potential to create a moderate to high level of change and result in adverse visual impacts that may be inconsistent with the VRM Class II objective (low level of change allowed) unless design adjustments are included.

Salinas Management Area

The Sierra de Salinas area of the Salinas MA is designated VRM Class III. Under Alternative B, this area would be closed to oil and gas leasing (Figure 2-2), which would be *consistent* with the VRM Class III objective (moderate level of change allowed). Additionally, the Ventana (and Silver Peak) Wilderness Area and Bear Mountain and Bear Canyon WSAs (VRM Class I) would be closed to leasing, which would be *consistent* with VRM Class I objective (only a very low level of change allowed).

San Benito Management Area

The Hernandez Valley, Call Mountain, and Laguna Mountain areas of the San Benito MA are designated VRM Class III (moderate level of change allowed). Under Alternative B, these areas would be closed to oil and gas leasing (Figure 2-2), which would be *consistent* with the Class III objective.

Leases Subject to Settlement Agreement

Portions of Leases CACA 053828, 053829, 053830, 053833, and 053834 are located in areas that would be open to oil and gas leasing with CSU stipulations in the Griswold Hills area of the San Joaquin MA that is designated VRM Class III (Figure 2-2 and Table 2-3). Even with CSU stipulations, oil and gas leasing has potential to create a high level of visual change and, therefore, result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective unless design adjustments are included. Other areas located in the Griswold Hills would be closed to oil and gas leasing (Figure 2-2), which would be *consistent* with the VRM Class III objective. The remaining 9 leases would be would be *consistent* with the VRM Class IV objective, as discussed in Section 4.13.2 (Impacts Common to All Alternatives).

4.13.5 Impacts of Alternative C

Alternative C would include: (1) areas that would be open to oil and gas leasing with CSU stipulations, (2) areas that would be open to leasing with NSO stipulations, and (3) areas that would be closed to leasing (Figure 2-3).

Mitigation Measures VR-1 through VR-10 and AQ-1 in Appendix C include the types of measures that could be implemented to lessen the degree of potential adverse visual impacts from oil and gas leases associated with Alternative C.

Central Coast Management Area

The Fort Ord National Monument is closed to oil and gas leasing under Alternative C (Figure 2-3); this would be *consistent* with the VRM Class I objective.

San Joaquin Management Area

Under Alternative C, the Panoche Hills, Griswold, Tumey, and Ciervo Hills and Coalinga Mineral Springs areas (VRM Class III) of the San Joaquin MA would contain areas open to oil and gas leasing with CSU stipulations (Figure 2-3). Even with CSU stipulations, the leases have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed) unless design adjustments are included. The Panoche Hills area would also contain areas open to oil and gas leasing with NSO stipulations (Figure 2-3). The leases with NSO stipulations would result in no visually apparent surface disturbance and would, therefore, be consistent with the VRM Class III objective.

The Joaquin Rocks area is designated VRM Class II. Under Alternative C, this area would also be open to oil and gas leasing with CSU stipulations (Figure 2-3). Even with CSU stipulations, however, the leases have potential to create a moderate to high level of change and result in adverse visual impacts that *may be*

inconsistent with the VRM Class II objective (low level of change allowed) unless design adjustments are included.

Salinas Management Area

The Sierra de Salinas area of the Salinas MA is designated VRM Class III. The Ventana and Silver Peak Wilderness Areas (both managed by the U.S. Forest Service) receive visual resource protections comparable to the BLM's VRM Class I objective (only a very low level of change allowed). Bear Mountain and Bear Canyon WSAs are designated VRM Class I. Under Alternative C, all of these areas would be closed to oil and gas leasing (Figure 2-3), which would be *consistent* with: (1) the VRM Class III objective (moderate level of change allowed), (2) protections comparable to the VRM Class I objective, and (3) the VRM Class I objective.

San Benito Management Area

Under Alternative C, the Hernandez Valley and Call Mountain areas (VRM Class III) of the San Benito MA would contain: (1) areas open to oil and gas leasing with CSU stipulations and (2) areas open to leasing with NSO stipulations (Figure 2-3). Even with CSU stipulations, the leases have potential to create a high level of visual change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed) unless design adjustments are included. The leases with NSO stipulations would result in no visually apparent surface disturbance and would, therefore, be consistent with the VRM Class III objective.

The Laguna Mountain area (Class III) would contain: (1) areas closed to leasing and (2) areas open to leasing with NSO stipulations (Figure 2-3). The closure of areas to leasing would be *consistent* with the VRM Class III objective. The leases with NSO stipulations would result in no visually apparent surface disturbance and would also be consistent with the VRM Class III objective.

Leases Subject to Settlement Agreement

Leases CACA 053828, 053829, 053830, 053833, and 053834 are located in areas that would be open to oil and gas leasing with CSU stipulations in the Griswold Hills area of the San Joaquin MA (Figure 2-3) that is designated VRM Class III. Even with CSU stipulations, the leases have potential to create a high level of visual change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective unless design adjustments are included. The remaining 9 leases would be would be *consistent* with the VRM Class IV objective as discussed in Section 4.13.2 (Impacts Common to All Alternatives).

4.13.6 Impacts of Alternative D

Alternative D includes: (1) areas that would be open to oil and gas leasing with CSU stipulations, (2) areas that would be open to leasing with NSO stipulations, and (3) areas that would be closed to leasing (Figure 2-4).

Mitigation Measures VR-1 through VR-10 and AQ-1 in Appendix C include the types of measures that could be implemented to lessen the degree of potential adverse visual impacts from oil and gas leases associated with Alternative D.

Central Coast Management Area

The Fort Ord National Monument is closed to oil and gas leasing under Alternative D (Figure 2-4); this would be *consistent* with the VRM Class I objective.

San Joaquin Management Area

Under Alternative D, the Panoche Hills, Griswold, Tumey, and Ciervo Hills, and Coalinga Mineral Springs areas (VRM Class III) of the San Joaquin MA would contain areas open to oil and gas leasing with CSU stipulations (Figure 2-4). Even with CSU stipulations, the leases have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed) unless design adjustments are included.

These same areas would also contain areas open to oil and gas leasing with NSO stipulations (i.e., Panoche, Griswold, Tumey, and Ciervo Hills) and areas closed to leasing (i.e., Griswold Hills and Coalinga Mineral Springs; Figure 2-4). The leases with NSO stipulations and areas closed to leasing would result in no visually apparent surface disturbance and no surface disturbance, respectively, and would, therefore, be *consistent* with the VRM Class III objective.

The Joaquin Rocks area is designated VRM Class II. Under Alternative D, this area would be open to oil and gas leasing with CSU stipulations (Figure 2-4). Even with CSU stipulations, the leases have potential to create a moderate or high level of visual change and result in adverse visual impacts that *may be inconsistent* with the VRM Class II objective (low level of change allowed) unless design adjustments are included. Other areas in the Joaquin Rocks area would be open to oil and gas leasing with NSO stipulations (Figure 2-4), so there would be no visually apparent surface disturbance. The leases with NSO stipulations would be *consistent* with the VRM Class II objective.

Salinas Management Area

The Sierra de Salinas area of the Salinas MA is designated VRM Class III. Under Alternative D, this area would contain: (1) areas open to oil and gas leasing with CSU stipulations and (2) areas closed to leasing (Figure 2-4). Even with CSU stipulations, the leases have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed) unless design adjustments are included. The areas closed to leasing, however, would be *consistent* with that objective.

The Ventana (and Silver Peak) Wilderness Area would be closed to oil and gas leasing under Alternative D (Figure 2-4), which would be *consistent* with visual resource protections comparable to the VRM Class I objective (only a very low level of change allowed) that would be afforded by the managing agencies. The Bear Mountain and Bear Canyon WSAs would also be closed to oil and gas leasing (Figure 2-4), which would be *consistent* with the VRM Class I objective.

San Benito Management Area

Under Alternative D, the Hernandez Valley, Call Mountain, and Laguna Mountain areas (VRM Class III) of the San Benito MA would contain areas open to oil and gas leasing with CSU stipulations (Figure 2-4). Even with CSU stipulations, the leases have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed) unless design adjustments are included. Under Alternative D, these areas would also contain areas closed to leasing (Figure 2-4), which would be *consistent* with the VRM Class III objective.

Leases Subject to Settlement Agreement

Some or all of Leases CACA 053828, 053829, 053830, 053833, and 053834 are located in areas that would be open to oil and gas leasing with CSU stipulations in the Griswold Hills area of the San Joaquin MA (Figure 2-4 and Table 2-3) that is designated VRM Class III. Even with CSU stipulations, the leases have potential to create a high level of visual change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective unless design adjustments are included. The remaining 9 leases would be would be *consistent* with the VRM Class IV objective as discussed in Section 4.13.2 (Impacts Common to All Alternatives).

4.13.7 Impacts of Alternative E

Alternative E includes: (1) areas that would be open to oil and gas leasing with CSU stipulations, (2) areas that would be open to leasing with NSO stipulations, and (3) areas that would be closed to leasing (Figure 2-5).

Mitigation Measures VR-1 through VR-10 and AQ-1 in Appendix C include the types of measures that could be implemented to lessen the degree of potential adverse visual impacts from oil and gas leases associated with Alternative E.

Central Coast Management Area

The Fort Ord National Monument is closed to oil and gas leasing under Alternative E (Figure 2-5); this would be *consistent* with the VRM Class I objective.

San Joaquin Management Area

Under Alternative E, the Panoche, Griswold, Tumey, and Ciervo Hills and Coalinga Mineral Springs areas (VRM Class III) of the San Joaquin MA would contain areas open to oil and gas leasing with CSU stipulations (Figure 2-5). Even with CSU stipulations, the leases have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed) unless design adjustments are included.

Panoche Hills and Griswold Hills (VRM Class III) would also contain areas open to oil and gas leasing with NSO stipulations and both would contain areas closed to leasing (Figure 2-5). The leases with NSO stipulations and areas closed to leasing would result in no visually apparent surface disturbance and no surface disturbance, respectively, and would, therefore, be *consistent* with the VRM Class III objective.

The Joaquin Rocks area is designated VRM Class II. Under Alternative E, this area would be open to oil and gas leasing with CSU stipulations (Figure 2-5). Even with CSU stipulations, the leases have potential to create a moderate to high level of visual change and result in adverse visual impacts that *may be inconsistent* with the VRM Class II objective (low level of change allowed) unless design adjustments are included. Other areas in the Joaquin Rocks area would be open to oil and gas leasing with NSO stipulations (Figure 2-5), so there would be no visually apparent surface disturbance. The leases with NSO stipulations would be *consistent* with the VRM Class II objective.

Salinas Management Area

The Sierra de Salinas area of the Salinas MA is designated VRM Class III. Under Alternative E, this area would contain areas open to oil and gas leasing with CSU stipulations (Figure 2-5). Even with CSU stipulations, the leases have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed) unless design adjustments are included. The Sierra de Salinas area would also contain areas open to leasing with NSO stipulations (Figure 2-5). The leases with NSO stipulations would be *consistent* with the VRM Class III objective since there would be no visually apparent surface disturbance.

The Ventana (and Silver Peak) Wilderness Area and Bear Mountain and Bear Canyon WSAs (VRM Class I) would be closed to oil and gas leasing (Figure 2-5); this would be consistent with VRM Class I objective.

San Benito Management Area

Under Alternative E, the Hernandez Valley, Call Mountain, and Laguna Mountain areas (VRM Class III) of the San Benito MA would contain areas open to oil and gas leasing with CSU stipulations (Figure 2-5). Even with CSU stipulations, the leases have potential to create a high level of change and result in adverse

visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed) unless design adjustments are included. The Laguna Mountain area would also contain areas open to leasing with NSO stipulations (Figure 2-5). Since there would be no visually apparent surface disturbance, those leases would be *consistent* with the VRM Class III objective.

Leases Subject to Settlement Agreement

Portions of Leases CACA 053828, 053829, 053830, 053833, and 053834 are located in areas that would be open to oil and gas leasing with CSU stipulations in the Griswold Hills area of the San Joaquin MA (Figure 2-5 and Table 2-3) that is designated VRM Class III. Even with CSU stipulations, the leases have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective unless design adjustments are included. Some of the leases are also located in areas that would be open to oil and gas leasing with NSO stipulations (Figure 2-5; portions of Leases CACA 053829, 053830, 053833, and 053834), which would be *consistent* with the VRM Class III objective since there would be no visually apparent surface disturbance. The remaining 9 leases would be would be *consistent* with the VRM Class IV objective as discussed in Section 4.13.2 (Impacts Common to All Alternatives).

4.13.8 Impacts of Alternative F

Alternative F includes: (1) areas that would be open to oil and gas leasing with CSU stipulations, (2) areas that would be open to leasing with NSO stipulations, and (3) areas that would be closed to leasing (Figure 2-6).

Mitigation Measures VR-1 through VR-10 and AQ-1 in Appendix C include the types of measures that could be implemented to lessen the degree of potential adverse visual impacts from oil and gas leases associated with Alternative F.

Central Coast Management Area

The Fort Ord National Monument is closed to oil and gas leasing under Alternative F (Figure 2-6); this would be *consistent* with the VRM Class I objective.

San Joaquin Management Area

The Panoche, Griswold, Tumey, and Ciervo Hills and Coalinga Mineral Springs areas of the San Joaquin MA are designated VRM Class III. Under Alternative F, these areas would contain: (1) areas open to oil and gas leasing with CSU, (2) areas open to leasing with NSO stipulations, and (3) areas closed to oil and gas leasing (Figure 2-6). Under Alternative F, areas open to oil and gas leasing with CSU stipulations (Figure 2-6) have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class II (low level of change allowed) and Class III (moderate level of change allowed) objectives unless design adjustments are included. Areas open to oil and gas leasing with NSO stipulations and areas closed to leasing would result in no visually apparent surface disturbance and no surface disturbance, respectively, and would, therefore, be *consistent* with VRM Class II and III objectives.

The Joaquin Rocks area is designated VRM Class II. Under Alternative F, this area would contain: (1) areas open to oil and gas leasing with CSU stipulations and (2) areas open to leasing with NSO stipulations (Figure 2-6). Oil and gas leasing with CSU stipulations has potential to create moderate to high levels of visual change and result in adverse visual impacts that would *likely be inconsistent* with the VRM Class II objective (only a low level of change allowed) unless design adjustments are included. Leases with NSO stipulations would result in no visually apparent surface disturbance, which would be *consistent* with the VRM Class II objective.

Salinas Management Area

The Sierra de Salinas area of the Salinas MA is designated VRM Class III. Under Alternative F, this area would contain both areas open to oil and gas leasing with CSU stipulations and areas closed to leasing (Figure 2-6). Even with CSU stipulations, areas open to leasing would have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed) unless design adjustments are included. The areas closed to leasing, however, would be *consistent* with that objective.

The Ventana (and Silver Peak) Wilderness Area, Bear Mountain WSA, and Bear Canyon WSA would all be closed to oil and gas leasing under Alternative F (Figure 2-6), which would be *consistent* with their assigned VRM Class I objective.

San Benito Management Area

Under Alternative F, areas open to leasing with CSU stipulations, which include the Hernandez Valley, Call Mountain, and Laguna Mountain areas (VRM Class III), have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objectives (moderate level of change allowed) unless design adjustments are included.

Leases Subject to Settlement Agreement

Leases CACA 053828, 053829, 053830, 053833, and 053834 are located in areas that would be open to oil and gas leasing with CSU stipulations in the Griswold Hills area of the San Joaquin MA (Figure 2-6) that is designated VRM Class III. Even with CSU stipulations, the leases have potential to create a high level of visual change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective unless design adjustments are included. The remaining 9 leases would be *consistent* with the VRM Class IV objective as discussed in Section 4.13.2 (Impacts Common to All Alternatives).

4.14 Special Management Areas

This section provides the impact analysis for the potential effects to national monuments, national recreation and historic trails, Areas of Critical Environmental Concern (ACECs), Research Natural Areas (RNAs), Wilderness Areas, and Wilderness Study Areas (WSAs), by alternative. These SMAs are described in Section 3.14 and are shown in Figure 3.14-1. The BLM-administered lands with wilderness characteristics are not SMAs, but the effects to these areas are described in this section because of the overlap with other special designations. Effects on Wild and Scenic Rivers are discussed in Section 4.21.

4.14.1 Introduction

Approach to Impact Assessment

This analysis identifies effects of management decisions on the BLM's ability to prevent irreparable damage to the values associated with each SMA. In concert with the BLM guidelines, the impact analysis considers management actions that "defend or guard against damage or loss" to the relevant and important values. This includes effects to values that could be restored and those that would be irreparable during the 20-year planning period. The management actions associated with the alternatives could either degrade or retain the relevant and important values.

BLM is unable to quantify impacts on special management areas from the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.14. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects on special management areas from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground. Other incomplete or unavailable information includes the type(s) of development(s) and site-specific resource conditions because it's impossible for BLM to know how, where, or when leases would be developed.

Therefore, BLM is unable to quantify effects on wilderness, WSAs, lands with wilderness characteristics, ACECs, national trail systems, or other special designations under the range of alternatives. As a result, the evaluation of such impacts considers current resource conditions described in Section 3.14, and the regulatory framework described in Appendix J.

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of federal minerals in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99 percent) of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects on special management areas in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

Assumptions

The analysis is based on the following assumptions:

- The BLM would continue to manage each ACEC according to the prescriptions included in the 2007 HFO RMP.

- Under all alternatives, WSAs will continue to be managed according to BLM Manual 6330 (Management of BLM Wilderness Study Areas) until such time that Congress designates them as Wilderness Areas or releases them from consideration.
- Under the 2007 HFO RMP, prior existing rights within Wilderness Areas and WSAs are permitted to continue. As the proposed RMPA alternatives would not alter the management of Wilderness Areas and WSAs, the effects of valid existing rights are not included in the analysis.
- Future environmental analyses would be conducted, as appropriate, for project- and site-specific actions proposed in the CCFO Planning Area. Applications for Permit to Drill would address potential conflicts between oil and gas development and other resources within the site specific area.
- As described in Section 2.5.2, implementation of each alternative is assumed to result in the no more than 37 exploratory and development wells (32 development wells for Alternative B) and up to 206 acres of associated surface disturbance (up to 179 for Alternative B) during the 15- to 20-year period of analysis.
- All surface-disturbing activities related to the 2015 RFD Scenario would most likely occur on Federal mineral estate in Fresno, Monterey, and San Benito Counties within the area of high oil and gas occurrence potential (shown in Figure 5-1) for the CCFO Planning Area but may potentially occur anywhere that is open to oil and gas leasing. New oil and gas well locations would most likely be within or near established producing oil and gas fields.

4.14.2 Impacts Common to All Alternatives

As discussed in Section 3.14, SMAs are managed by the BLM in order to protect their ecological, historic, cultural, scenic, scientific, and recreation resources and values. While specific SMAs such as the Panoche-Coalinga ACEC have been open to oil and gas leasing under the 2007 HFO RMP, SMA designations generally limit available areas for energy development and require stipulations for oil and gas leases.

The following SMAs were closed to oil and gas leasing under the 2007 HFO RMP, and would continue to be closed under all alternatives:

- Wilderness Areas
- Wilderness Study Areas
- Fort Ord National Monument
- Clear Creek Serpentine ACEC

Table 4.14-1 displays acres of lands with wilderness characteristics (LWC) that would be closed, open to oil and gas leasing with CSU, or open with NSO [to protect other resource values] under each alternative.

Table 4.14-1. Lands with Wilderness Characteristics on Federal Mineral Estate by Alternative

Alternative	Open with CSU	Closed	Open with NSO
A (No Action)	28,100	0	6,300
B	4,100	30,300	N/A
C	31,700	2,700	0
D	18,400	13,300	2,700
E	21,800	0	12,600
F	28,100	0	6,300

The severity of impacts from oil and gas development on SMAs is dependent upon the degree to which oil and gas activities would affect the specific resources for which an SMA is designated. Impacts may vary in intensity and duration depending on the location and duration of oil and gas development within an SMA and the type of resource values that are protected. As described in the 2015 RFD Scenario, it is unlikely that more than 37 exploratory and development wells would be drilled on Federal oil and gas leases, and total estimated ground disturbance would not be expected to exceed 206 acres.

Although specific SMAs would be closed to oil and gas leasing under each alternative, oil and gas development outside of SMAs could indirectly affect these special designations. For example, noise associated with oil and gas development (e.g., truck traffic, drilling, well pumps, compressors, etc.) as well as a severe degradation of air quality[2] could alter the habitat conditions for biological resources that are protected within an SMA, which would create a moderate impact on these resources. A major impact to an SMA could result from surface disturbance and the presence of industrial infrastructure that would permanently alter the visual character of land surrounding the SMA. However, the degree of impact would depend on the final location of the estimated 206 acres of disturbance. Over the long-term, oil and gas development may create permanent impacts to an SMA's resource values such that the eligibility of the SMA (i.e., purpose for its special designation) would change. An SMA that was to lose its eligibility for a special designation would have suffered major impacts to its resource values.

During the BLM's Social and Economic Workshop held on February 4, 2015, a primary concern expressed by participants was the adequacy of protection measures to minimize the impacts to local resources from oil and gas development (see Appendix F). Sections 4.14.3 through 4.14.6 discuss the effectiveness of proposed stipulations as well as the need for additional mitigation to protect SMAs.

Leases Subject to Settlement Agreement

None of the 14 non-NSO leases would be located within 2 miles of an SMA. Given the distance of these leases from SMAs, which is the same for each of the RMPA alternatives, future oil and gas development within the 14 lease areas would create a negligible impact on special designations. Therefore, the leases subject to settlement agreement are not discussed further.

4.14.3 Impacts of Alternative A (No Action)

Section 4.14.2 lists the SMAs that would be closed to oil and gas development under all alternatives. The following SMAs would be open to oil and gas leasing under Alternative A:

- Juan Bautista de Anza National Historic Trail
- Coalinga Mineral Springs National Recreation Trail
- Panoche-Coalinga ACEC (subject to NSO stipulations)
- Joaquin Rocks ACEC (subject to NSO stipulations)

As identified above, NSO stipulations would apply to the ACECs and the RNA open to leasing under Alternative A. The text of this NSO stipulation is included below and described in detail in Appendix C (Statewide Stipulations):

> *The NSO-General stipulation would be applied when adequate protection of surface resources cannot be provided through mitigation, and fluid mineral development of the lease from an off-site location is recommended. If there is no surface location available for directional drilling, the land would not be leased.*

[2] Air emission sources during oil and gas development include construction equipment, combustion emissions, fugitive natural gas, and fugitive dust. See Section 4.5 (Air Quality and Atmospheric Conditions) and Section 4.6 (Greenhouse Gas Emissions/Climate Change) for a full discussion of air emission impacts.

With application of this NSO stipulation, oil and gas leases would not be granted in the event that a surface location is not available for directional drilling, which would effectively protect important SMA resource values. Impacts to the ACECs and RNA that would be open to leasing under Alternative A would occur over the long-term (i.e., during oil and gas drilling and production), but would be minor given that SMAs would be managed with NSO stipulations. As discussed in Sections 4.14.4 through 4.14.8, the degree of impact from Alternative A would be less than Alternatives C, E, and F due to the larger acreage where Alternative A would apply NSO stipulations to SMAs, in particular the Panoche-Coalinga ACEC. However, overall impacts to SMAs from Alternative A would be greater than Alternatives B and D given that a larger acreage of Federal mineral estate within SMAs would be open to leasing under Alternative A than Alternatives B and D.

Special designations not subject to NSO stipulations under Alternative A include the national historic and national recreation trails listed above. Without stipulations or other conditions of approval, if oil and gas development occurred along these trails it could degrade cultural or historic resources (i.e., Juan Bautista de Anza National Historic Trail), or conflict with designated recreation uses (i.e., hunting at Coalinga Mineral Springs National Recreation Trail) leading to effects that range from minor impacts over the short-term (e.g., temporary trail closure or reroute, construction noise and fugitive dust) to major impacts over the long-term (e.g., area no longer suitable for recreational use).

Lands with Wilderness Characteristics

As shown in Table 4.14-1, under Alternative A all LWC would be open to oil and gas leasing with CSU or NSO stipulations (34,400 acres) to protect other resource values. With application of stipulations, oil and gas leases would not be granted should a surface location be unavailable for directional drilling, which would indirectly benefit LWC resource values. However, given the amount of LWC acreage open for leasing, Alternative A has the potential to reduce the overall amount of LWC within the study area. As discussed in Sections 4.14.4 through 4.14.8, the degree of potential impact to LWC under Alternative A is considered greatest when compared to Alternatives B through D, due to the greatest amount of total LWC acreage open for leasing (with CSU and NSO stipulations). Alternative A would have the equal amount of total acreage available for leasing when compared to Alternatives E and F, however it would designate more acreage open with CSU stipulations than Alternative E. Even with CSU and NSO stipulations to manage oil and gas leasing, loss of LWC acreage from surface development is considered to diminish the overall wilderness characteristic of surrounding lands.

4.14.4 Impacts of Alternative B

Section 4.14.2 lists the SMAs that would be closed to oil and gas development under all alternatives. The following SMAs would be partially open to oil and gas leasing under Alternative B:

- Panoche-Coalinga ACEC (the majority of the ACEC would be closed to leasing)
- Joaquin Rocks ACEC (the majority of the ACEC would be closed to leasing)

The NSO stipulation discussed in Section 4.14.3 would not apply to the SMAs open for oil and gas leasing under Alternative B. Without stipulations or other conditions of approval, if oil and gas development occurred within SMAs it could degrade biological resources (i.e., Panoche-Coalinga ACEC), visual resources (i.e., Joaquin Rocks ACEC), or conflict with designated recreation uses. This could lead to effects ranging from minor impacts over the short-term (e.g., temporary closure to public access, construction noise and fugitive dust) to major impacts over the long-term (e.g., area no longer eligible for special designation). Unlike Alternative A, Alternative B would apply CSU stipulations to all Federal mineral estate open to leasing, which are used to alter the site-specific location of well pads, pipelines, and roads to avoid important resources. CSU stipulations would effectively minimize indirect impacts to SMAs. Given that Alternative B would have the fewest acres of open areas on SMAs and CSU stipulations would apply to all

open lease areas, Alternative B would create the least adverse effects on SMAs compared with all other alternatives. Mitigation measure SMA-1 to minimize impacts to SMAs is included in Appendix C.

Lands with Wilderness Characteristics

As shown in Table 4.14-1 under Alternative B, the majority of LWC would be closed to oil and gas leasing (30,300 acres). The remainder of LWC would be open to oil and gas leasing with CSU stipulations to protect other resource values. With application of stipulations, oil and gas leases would not be granted should a surface location be unavailable for directional drilling, which would indirectly benefit LWC resource values. Given the amount of LWC acreage closed to leasing, Alternative B is considered to have the least potential impact to LWC when compared to Alternatives A and C through F.

4.14.5 Impacts of Alternative C

Section 4.14.2 lists the SMAs that would be closed to oil and gas leasing under all alternatives. The following SMAs would be open to oil and gas leasing under Alternative C:

- Coalinga Mineral Springs National Recreation Trail
- Panoche-Coalinga ACEC (some areas within the ACEC would be closed to leasing)
- Joaquin Rocks ACEC

The NSO stipulation discussed in Section 4.14.3 would not apply to the SMAs open for oil and gas leasing under Alternative C. Without stipulations or other conditions of approval, if oil and gas development occurred within SMAs it could degrade biological resources (i.e., Panoche-Coalinga ACEC), visual resources (i.e., Joaquin Rocks ACEC), or conflict with designated recreation uses (i.e., hunting at Coalinga Mineral Springs National Recreation Trail). This could lead to effects ranging from minor impacts over the short-term (e.g., temporary closure to public access, construction noise and fugitive dust) to major impacts over the long-term (e.g., area no longer eligible for special designation). The degree of impact from Alternative C could be the greatest among all of the alternatives given that Alternative C would have the greatest acreage of SMAs open to oil and gas leasing, and none of this acreage would be subject to NSO stipulations.

Mitigation Measures SMA-1 and SMA-2 in Appendix C would apply to the avoidance or reduction of impacts to SMAs. The effectiveness of these measures and the potential for residual impact following their implementation would depend on the exact location of future oil and gas lease sites relative to each SMA, as well as project-specific conditions.

Lands with Wilderness Characteristics

As shown in Table 4.14-1, under Alternative C the majority of LWC would be open to oil and gas leasing (31,700 acres) with CSU stipulations to protect other resource values. The remainder of LWC would be closed to oil and gas leasing. With application of stipulations, oil and gas leases would not be granted should a surface location be unavailable for directional drilling, which would indirectly benefit LWC resource values. As discussed in Sections 4.14.4 through 4.14.8, the degree of potential impact to LWC under Alternative C is considered third greatest (less potential impact to LWC compared to Alternatives A and F, but more potential impact when compared to Alternatives B, D, and E). Even with CSU stipulations to manage oil and gas leasing, loss of LWC acreage from surface development is considered to diminish the overall wilderness characteristic of surrounding lands.

4.14.6 Impacts of Alternative D

Section 4.14.2 lists the SMAs that would be closed to oil and gas development under all alternatives. The following SMAs would be open to oil and gas leasing under Alternative D:

- Coalinga Mineral Springs National Recreation Trail (some areas around the trail would be closed to leasing)
- Panoche-Coalinga ACEC (mostly open and subject to NSO stipulations including for the Monvero Dunes RNA; some areas within the ACEC would be closed to leasing)
- Joaquin Rocks ACEC (subject to NSO stipulations)

As identified above, NSO stipulations would apply to the ACECs and the RNA open to leasing under Alternative D. The text of this NSO stipulation is presented under Alternative A. With application of this NSO stipulation, oil and gas leases would not be granted in the event that a surface location is not available for directional drilling, which would effectively protect important SMA resource values. Impacts to the ACECs and RNA that would be open to leasing under Alternative D could occur over the long-term (i.e., during oil and gas drilling and production), but would be minor given that SMAs would be managed with NSO stipulations. The degree of impact from Alternative D could be less than Alternatives A, C, E, and F given that Alternative D would have less acreage available for oil and gas leasing within and around SMAs. However, the complete closure of SMAs to oil and gas leasing under Alternative B would create less of an impact (i.e., negligible impact) on SMAs than under Alternative D (i.e., minor impact).

A special designation that would not be subject to NSO stipulations under Alternative D is the Coalinga Mineral Springs National Recreation Trail. Without stipulations or other conditions of approval, if oil and gas development occurred along this trail it could conflict with designated recreation uses (i.e., hunting). This would lead to effects that range from minor impacts over the short-term (e.g., temporary trail closure or reroute, construction noise and fugitive dust) to major impacts over the long-term (e.g., area no longer suitable for recreational use).

Mitigation Measure SMA-2 in Appendix C would apply to the avoidance or reduction of impacts to the Coalinga Mineral Springs National Recreation Trail, depending on future oil and gas lease sites and project-specific conditions.

Lands with Wilderness Characteristics

As shown in Table 4.14-1, Alternative D provides the greatest balance of LWC to be open and closed to oil and gas leasing when compared to all other alternatives. Under Alternative D, 20,100 acres would be open to oil and gas leasing with CSU and NSO stipulations to protect other resource values. The remainder of LWC would be closed (13,300 acres) to oil and gas leasing under Alternative D. With application of stipulations, oil and gas leases would not be granted should a surface location be unavailable for directional drilling, which would indirectly benefit LWC resource values. As discussed in Sections 4.14.4 through 4.14.8, the degree of potential impact to LWC under Alternative D is considered second least (less potential impact to LWC compared to Alternatives A, C, E, and F but more potential impact when compared to Alternative B). Even with CSU stipulations to manage oil and gas leasing, loss of LWC acreage from surface development is considered to diminish the overall wilderness characteristic of surrounding lands.

4.14.7 Impacts of Alternative E

Section 4.14.2 lists the SMAs that would be closed to oil and gas development under all alternatives. The following SMAs would be open to oil and gas leasing under Alternative E:

- Juan Bautista de Anza National Historic Trail (subject to NSO stipulations along some areas of the trail)
- Coalinga Mineral Springs National Recreation Trail
- Panoche-Coalinga ACEC (mostly open; subject to NSO stipulations within a small area of the ACEC)
- Joaquin Rocks ACEC

The NSO stipulation discussed in Section 4.14.3 would not apply to many of the SMAs open for oil and gas leasing under Alternative E. Without stipulations or other conditions of approval, if oil and gas development occurred within SMAs it could degrade biological resources (i.e., Panoche-Coalinga ACEC), visual

resources (i.e., Joaquin Rocks ACEC), degrade cultural or historic resources (i.e., Juan Bautista de Anza National Historic Trail), or conflict with designated recreation uses (i.e., hunting at Coalinga Mineral Springs National Recreation Trail). This would lead to effects that range from minor impacts over the short-term (e.g., temporary closure to public access, construction noise and fugitive dust) to major impacts over the long-term (e.g., area no longer eligible for special designation). The degree of impact from Alternative E would be less than Alternatives C given that Alternative E would have less acreage of SMAs open to oil and gas leasing and would require NSO stipulations in some lease areas. Overall impacts to SMAs from Alternative E would be greater than Alternatives A, B, D, and F as Alternative E would have more acreage of SMAs open to oil and gas leasing with less acreage subject to NSO stipulations compared with the other four alternatives.

Mitigation Measures SMA-1 and SMA-2 in Appendix C would apply to the avoidance or reduction of impacts to SMAs. The effectiveness of these measures and the potential for residual impact following their implementation would depend on the exact location of future oil and gas lease sites relative to each SMA, as well as project-specific conditions.

Lands with Wilderness Characteristics

As shown in Table 4.14-1, under Alternative E all LWC would be open to oil and gas leasing with CSU and NSO stipulations (34,400 acres) to protect other resource values. With application of stipulations, oil and gas leases would not be granted should a surface location be unavailable for directional drilling, which would indirectly benefit LWC resource values. However, given the amount of LWC acreage open for leasing, Alternative E has the potential to reduce the overall amount of LWC within the study area. As discussed in Sections 4.14.4 through 4.14.8, the degree of potential impact to LWC under Alternative E is considered greatest when compared to Alternatives B through D, due to the greatest amount of total LWC acreage open for leasing (with CSU and NSO stipulations). Alternative E would have the equal amount of total acreage available for leasing when compared to Alternative A and F, however it would designate less acreage open with CSU stipulations. Even with CSU and NSO stipulations to manage oil and gas leasing, loss of LWC acreage from surface development is considered to diminish the overall wilderness characteristic of surrounding lands.

4.14.8 Impacts of Alternative F

Section 4.14.2 lists the SMAs that would be closed to oil and gas development under all alternatives. The following SMAs would be open to oil and gas leasing under Alternative F:

- Juan Bautista de Anza National Historic Trail
- Coalinga Mineral Springs National Recreation Trail
- Panoche-Coalinga ACEC (subject to NSO stipulations within the Ciervo-Panoche Natural Area)
- Joaquin Rocks ACEC (subject to NSO stipulations)

While the NSO stipulation does not apply to all ACECs under Alternative F, it would apply to the Joaquin Rocks ACEC and ACECs within the Ciervo-Panoche Natural Area. Even with the CSU stipulations and other conditions of approval, oil and gas development within SMAs could degrade biological resources (i.e., ACECs outside the Ciervo-Panoche Natura Area), visual resources (i.e., Joaquin Rocks ACEC), , or conflict with designated recreation uses (i.e., hunting at Coalinga Mineral Springs National Recreation Trail). This would lead to effects that range from minor impacts over the short-term (e.g., temporary closure to public access, construction noise and fugitive dust) to major impacts over the long-term (e.g., area no longer eligible for special designation). The degree of impact from Alternative F could be less than Alternatives C and E given that Alternative F would have less acreage available for oil and gas leasing within and around SMAs. However, the applications of NSO to all ACECs under Alternative A, the closure of some of the Panoche-Coalinga ACEC and reduced impact to the trails under Alternative D, and the

complete closure of SMAs to oil and gas leasing under Alternative B would create less of an impact on SMAs than under Alternative F.

Mitigation Measure SMA-2 in Appendix C would apply to the avoidance or reduction of impacts SMAs, depending on future oil and gas lease sites and project-specific conditions.

Leases Subject to Settlement Agreement

As shown in Table 4.14-1, under Alternative F all LWC would open to oil and gas leasing with CSU or NSO stipulations (34,400 acres) to protect other resource values. With application of stipulations, oil and gas lease development may be relocated or restricted should an appropriate surface location be unavailable, which would indirectly benefit LWC resource values. However, given the amount of LWC acreage open for leasing, Alternative F has the potential to reduce the overall amount of LWC within the study area. The degree of potential impact to LWC under Alternative F is considered greatest when compared to Alternatives B through D, due to the greatest amount of total LWC acreage open for leasing (with CSU and NSO stipulations). Alternative F would have identical potential impact to LWC as Alternative A. Alternative E would have the equal amount of total acreage available for leasing when compared to Alternative F, however Alternative E would designate more acreage open with NSO stipulations. Even with CSU and NSO stipulations under Alternative F to manage oil and gas leasing, loss of LWC acreage from surface development is considered to diminish the overall wilderness characteristic of surrounding lands.

4.15 Cultural and Heritage Resources

The goals for cultural resource management in the CCFO Planning Area as identified in the 2007 Proposed Resource Management Plan (RMP) are to (1) identify, preserve, and protect significant cultural resources and ensure that they are available for appropriate uses by present and future generations; (2) provide access to areas managed by the CCFO for federally and non-federally recognized Native Americans and California Indians for the purpose of maintaining traditional values intrinsic to their cultural identities; (3) fulfill the essential roles that public communication and heritage education play in historic preservation; and (4) improve access where appropriate to cultural resources on public lands for the benefit of public use. With these goals in mind, potential consequences of the oil and gas development actions identified in the Reasonably Foreseeable Development (RFD) Scenario are assessed.

4.15.1 Introduction

Cultural resources include prehistoric and historic archaeological sites, artifacts and rock art, sacred sites and other culturally sensitive locations, buildings and structures, landscaping, historic trails and districts, and rural landscapes. Consideration and treatment of cultural resources by Federal agencies is mandated by a number of Federal statutes (see Section 3.15.2). Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies to "take into account the effects of Federal actions on historic properties" and outlines Federal agency responsibilities for identification, management, protection, preservation, and use of historic properties.

BLM is unable to quantify impacts on cultural and heritage resources from the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.15. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects on cultural and heritage resources from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground. Other incomplete or unavailable information includes the type(s) of development(s) and site-specific resource conditions because it's impossible for BLM to know how, where, or when leases would be developed.

A comprehensive survey of the Planning Area is not feasible, or reliable, because the timing, intensity, and/or location of future leasing and development activities is unknown. Therefore, BLM is unable to quantify effects on archaeological or historic sites under the range of alternatives. As a result, the evaluation of such impacts considers current resource conditions described in Section 3.15, and the regulatory framework described in Appendix J.

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of federal minerals in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99 percent) of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects on cultural and heritage resources in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

Assumptions

Cultural sites can potentially occur anywhere in the Decision Area, which has not been completely inventoried for the presence of cultural sites. Some yet to be identified cultural resources may be determined significant and qualify for consideration under the NHPA or spiritually important. Significant resources identified pursuant to the NHPA are designated as "historic properties" and are defined in 36 CFR 800.16(1) as "any prehistoric or historic district, site, building, structure or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP)." Archaeological components of historic properties on Federal lands are identified through survey, research, and often test excavations to determine their NRHP eligibility. Culturally sensitive locations may be identified through government-to-government consultation with federally recognized tribes and outreach to other Native American individuals and groups. Not all sites or places of cultural value may qualify as historic properties under the NHPA, but may be considered part of the environment for purposes of NEPA review and addressed under such authorities as AIRFA and Executive Order 13007, Sacred Sites.

Given the above considerations, the analysis of historic properties is based on the following assumptions:

- Archaeological sites are highly sensitive to impacts, which are irreversible, and result in irretrievable loss.
- Archaeological resources derive their data value from the context of the artifacts and physical features contained within the site. Therefore, disturbance of the arrangement of the site contents effectively destroys the information it contains.
- Unless determined otherwise, all cultural resources including archeological sites are treated as eligible historic properties and afforded the associated emphasis on preservation through avoidance of any potential adverse effect.
- Sensitive cultural resource records, site location information, and traditional cultural properties and values must be held confidential from the public as deemed appropriate to protect historic properties (NHPA, Section 304 [a], Archaeological Resource Protection Act [ARPA], Section 9[a]).
- Historic properties could continue to be found throughout the CCFO Planning Area, given the long history of occupation and the non-random distribution of critical resources (food, water, shelter, and raw materials for tools).
- The Juan Bautista de Anza National Historic Trail is located within the CCFO Planning Area. Oil and gas leasing and development has the potential for negative effects on the Juan Bautista de Anza Trail, including, but not limited to, archaeological resources, visual resources, recreation, and noise.
- Commonly in the region, historic properties are more likely to be found on shallow slopes and close to reliable water sources.
- Historic properties in the CCFO Planning Area have been buried, destroyed, or altered by natural agents (erosion and deposition) and human activity. Such disturbance from natural and human agents is likely to continue.
- Oil and gas exploration or development activities have the potential to cause irreversible disturbance and damage to non-renewable historic properties. The BLM could mitigate impacts to these resources from authorized uses through project avoidance, redesign, and, if necessary, data recovery investigations, in accordance with the BLM Manual 8100 and with the protocols set forth in the BLM's National Cultural Programmatic Agreement (2012) and the corresponding 2014 statewide agreement with the California State Historic Preservation Office.
- Operators must submit proposals for any site-specific project that would require the BLM approval. Additional site-specific Section 106 review will be conducted on these individual projects. The BLM

will complete comprehensive identification (e.g., field inventory), evaluation, protection, and mitigation following the pertinent laws, regulations, and policies.

- If the BLM cannot obtain access to locations on private property to conduct its NHPA review, the BLM can employ alternative methods of gathering information as contemplated in 36 CFR 800.4(b)(2). This might include, but is not limited to, the use of photography, aerial photography, online mapping technologies, UAV footage, ethnographic studies, or literature reviews.
- The BLM does not approve any ground-disturbing activities that may adversely affect any historic properties, sacred landscapes, and/or resources protected under the NHPA, American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Executive Order 13007, or other statutes and executive orders until it completes its obligations under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized, or mitigated.
- Upon request by Native Americans access to places of importance to Native American people would be accommodated when practicable.
- The BLM will continue to implement government-to-government consultation with federally and non-federally recognized tribes on a case-by-case basis for site-specific proposals which would help determine other issues of concern, including but not limited to access rights, disruptions of cultural practices, impacts on visual resources important to the tribes, and impacts on subsistence resources. It should be noted that even when consultation and an extensive inventory or data collection occur, not all impacts on tribally sensitive resources can be fully mitigated.

4.15.2 Impacts Common to All Alternatives

The RFD Scenario identifies a number of potential actions that could pose effects to cultural and historical resources in the CCFO Planning Area. The RFD Scenario states that between zero and 32 development wells and three to five exploratory wells could be expected over 15 to 20 years on Federal mineral estate. Associated with these wells are certain levels of surface-disturbing work including well pads (1 to 3 acres per well), roads (40 feet wide and 4.8 miles long per well location), pipeline (20 feet wide corridor and 0 to 10 miles in length), and related facilities for those wells that lead to development (zero to eight facilities at 1 acre per facility). The roads would be a 20-foot-wide gravel surface bordered by ditches, cuts, and fill. Total surface disturbance for each well is estimated to be 5.4 acres. The RFD Scenario also identified potentially up to 34 miles of seismic exploration work. The drill hole method of geophysical exploration could involve use of truck-mounted or portable air drills drilling four to 12 holes per mile of line and an explosive charge placed in each hole. Vehicles may include heavy truck-mounted drill rigs, track-mounted drill rigs, water trucks, computer recording trucks, and light pickups. Travel would use existing roads or disturbed areas, to the extent feasible. Overall, the RFD Scenario projects between 22.45 and 205.7 acres of disturbance. Development of new producing fields is not likely to occur on Federal mineral estate in the CCFO Planning Area as a result of the exploratory wells. Well stimulation treatment operations are expected to occur entirely within the well pad disturbance area but would increase vehicle presence involving control vans, pump trucks, a flatbed truck, a tanker, crane water trucks, sand trucks, and a manifold/treating iron trailer. Number of vehicles would vary depending on if an enhanced oil recovery (EOR) technique was employed. An assumption of this analysis is that a potentially significant level of activity is associated with each of the six alternatives identified in Chapter 2 except for Alternative B which offers substantially less acreage open for oil and gas development than the other alternatives.

Many of the ground disturbing actions identified in the RFD Scenario could affect pre-historic and historic resources or access to culturally sensitive areas. In regard to Section 106, many of the actions could also result in adverse effect determinations for purposes of compliance with Section 106 of the NHPA. According to 36 CFR 800.9(a), “an undertaking has an effect on a historic property when the undertaking

may alter characteristics of the property that may qualify the property for inclusion in the National Register." An effect is considered adverse when the effect on a National Register-eligible property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling or association. These effects are commonly caused by direct impacts of soil-disturbing activities or indirect impacts through visual or auditory intrusions. Adverse effects include the physical destruction of all or part of the property. Adverse effects on historic properties resulting from oil and gas development and exploration can include, but are not limited to:

- Physical destruction or alteration of all or part of the property;
- Isolation of the property from or alteration of the property's setting when that character contributes to the property's qualifications for listing in the National Register;
- Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting; or
- Unauthorized collection of artifacts by fieldworkers associated with the project

If ground disturbance from oil and gas development occurred at locations of known cultural resources such as those identified in Section 3.15.4 (Current Conditions or Trends) or at locations of unknown cultural resources, these adverse effects would be permanent and direct impacts on the resource because the sites are non-renewable resources that can be irretrievably lost if subject to certain management actions. As described in Section 3.15, the most likely sites to be encountered during oil and gas activities are prehistoric archaeological sites. For this area, the most common site types include residential occupation sites, often found in proximity of water sources such as rivers and springs, and small special use sites found in upland settings. The larger residential sites may also include human burials. Native American traditional use locations and built-environment sites are much less likely to be encountered. Establishment of a limited surface use stipulation for fluid mineral development based on the presence of recorded, eligible cultural resources within newly leased parcels can achieve avoidance for those resources that have surface cultural indicators, or that are important due to their cultural use. When avoidance is not feasible, the effects can be mitigated by a variety of methods based on the type of site and proposed action. The selected method(s) is determined by consultations between the Federal agency, SHPO, and the ACHP with applicable Native American tribes and the public as necessary. Mitigation for impacts to archaeological sites is often the recovery of a site's scientific data potential through excavation and archaeological study. Mitigation for built-environment properties is most often historical and architectural documentation prepared in accordance with Historic American Building Survey, Historic American Engineering Survey, or similar programs, in combination with interpretation of the property for purposes of public education and awareness. Mitigation of effects on sacred sites and other culturally sensitive locations could involve special accommodations for use of the areas and diminishing the potential effects on the setting of the location.

When avoidance of adverse effects on historic properties is not feasible or when they inadvertently occur in spite of site protection and preservation management practices, procedures identified in Section 9.0 of the Revised 2014 California *State Protocol Agreement* shall be employed to develop appropriate mitigation measures as necessary to resolve adverse effects under Section 106 (NHPA).

4.15.3 Impacts of Alternative A (No Action)

Alternative A includes 683,800 acres of Federal mineral estate in the CCFO Planning Area open for development and 41,700 acres designated for no surface occupancy (NSO). Despite NSO stipulations applied in some areas, the potential for impact to historic properties still remains due to their potential to be buried with few surface indicators. Impacts posed by Alternative A are the same as Impacts Common to All Alternatives. However, the varying acreages associated with each alternative indicates the potential concentration of oil and gas exploration and development since a similar amount of activity is assumed for each alternative. Compliance with Section 106 of the NHPA is intended to promote the protection and

preservation of those cultural sites determined to be historic properties so that authorized use of public lands would not result in adverse impacts to NRHP-eligible archaeological sites, traditional cultural properties, sacred sites, or built-environment resources. However, when avoidance of adverse impacts is not feasible due to overriding project or land use considerations, mitigation measures may be implemented as outlined below. Such an analysis recognizes the importance of government-to-government consultation with Native American tribes and other concerned parties on specific undertakings involving various authorized land uses. Authorized uses with high potential to directly affect historic properties and other culturally sensitive areas include new oil and gas leasing, mineral extraction and exploratory actions, road and pipeline construction, and facilities construction.

Best Management Practices (BMPs) and Standard Operating Procedures (SOPs) are provided in Appendix D including those for Cultural Resources. The practices and procedures most relevant to the treatment of cultural resources include:

- No construction or surface-disturbing activities shall occur without prior written authorization of the authorized BLM officer based, in part, on completion of compliance with Section 106 of the NHPA and other related authorities.
- Identification, safe avoidance, or mitigation of potential adverse effect on cultural properties shall be required on public land as a condition of a lease or permit associated with oil and gas development.
- On private property, the BLM will make every effort to gain access to such property. Inability to access property does not mean that BLM cannot satisfy its obligations to make a reasonable and good faith effort to identify historic properties, nor does it preclude the BLM from providing a reasonable opportunity to Indian tribes to identify concerns about historic properties of significance to the tribe.
- The BLM can consult with the State Historic Preservation Officer (SHPO) and complete the process using procedures described in 4.15.1 whether or not the BLM, interested Indian tribes, or other consulting parties, obtain access to the private property.
- The BLM can also impose a condition of approval (COA) on the APD that requires the operator to inform the BLM if the operator discovers any historic properties during the course of the drilling and production operations approved under the APD.
- Where avoidance or adequate protection is not feasible and the property is significant for the scientific data it may contain, initiate a data retrieval (excavation) of sites.
- Surface disturbance will be minimized as project applicants will be encouraged to utilize previously disturbed sites when feasible.
- Work area boundaries will be delineated with flagging, temporary fencing, or other marking.
- Resource protection may include installation of fencing, protective barriers, or site capping to minimize surface disturbance or impacts on culturally sensitive resources; the potential of certain protective measures (e.g., fencing) that may draw unwanted attention to sites or inadvertently restrict access to traditional use areas shall be considered.
- BLM will continue open dialogue and share information through government-to-government consultation with federally recognized tribes and with other Native Americans and ethnic groups that have cultural ties to lands proposed for development.
- The presence or absence of cultural properties will be determined prior to the approval of any surface-disturbing activity through such means as cultural resource field inventories, archival research, oral history, or other data gathering means deemed appropriated and evaluations of identified resources shall be evaluated and appropriate treatment measures identified for all project areas subject to surface disturbance or visual intrusions.

- When cultural properties are present, the project would be redesigned or modified to the extent feasible to safely avoid impacting cultural sites or steps taken to adequately mitigate impacts through project redesign or data recovery.
- The proximity of the Juan Bautista de Anza National Historic Trail to any proposed exploration or development shall be determined and protective measures shall be applied to the extent relevant and feasible consistent with NPS planning goals and the BLM National Scenic and Historic Trail policy and guidance (see BLM Manuals 6250 and 6280).
- During periods of high rainfall and runoff or when soils are wet and muddy, soil-disturbing activities shall be avoided in order to minimize impacts to nearby culturally sensitive resources vulnerable to soil erosion.
- On public land discovery during construction activities of a cultural resource or of Native American human remains and/or related cultural items pursuant to NAGPRA shall be reported to the authorized officer and all activity in the immediate discovery area associated with the project be suspended until an evaluation of the discovery is made by the archaeologist to determine appropriate actions to prevent further disturbance of remains and related cultural items or the loss of significant cultural or scientific values. A written authorization to resume the project, or to take appropriate mitigation action, will be issued by the authorized officer.
- Additional archaeological or cultural surveys and further consultation with tribes will be required in the event a proposed project or its location is changed or modified after the consultation, initial survey is completed; the inventory, associated documentation, and necessary compliance would be completed prior to project approval.

Leases Subject to Settlement Agreement – Subalternative 1

The record search did not identify resources located in these parcels. Cultural sites can potentially occur in parcels that have not been completely inventoried for the presence of cultural sites. Some yet to be identified cultural resources may be determined significant and qualify for consideration under the NHPA or spiritually important. The same procedures for identification, evaluation, and protection described in Section 4.15.1 would apply to these parcels involving records searches, field inventories, and consultation with tribes where warranted based on expectations and past disturbance patterns. Therefore, the potential impacts and BMPs and SOPs for these lease areas would be similar to those discussed for the larger Planning Area.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impacts would occur, and therefore, the procedures for identification, evaluation, and protection described in Section 4.15.1 would not be applicable.

4.15.4 Impacts of Alternative B

Alternative B consists of over 39,000 acres open for development with CSU stipulations, the least amount of acreage open for oil and gas development and only 5 percent of the amount in Alternative A. In contrast with the 2015 RFD Scenario, Alternative B would not have 5 exploratory wells, and ground disturbance would be 179 acres because development is limited to the existing oil and gas fields, plus buffer.

As a result, potential oil and gas development activities will be more concentrated, and potentially would use more land that was previously disturbed because it would be located within existing oil and gas fields and a buffer around these fields. The types of impacts to cultural resources would be the same as described for Alternative A. The BMPs and SOPs and potentially resulting mitigation identified for Alternative A would remain the same for Alternative B.

Leases Subject to Settlement Agreement

Cultural sites can potentially occur in parcels that have not been completely inventoried for the presence of cultural sites. Some yet to be identified cultural resources may be determined significant and qualify for consideration under the NHPA or spiritually important. Most leased areas would be closed for development (see Tables 2-2 and 2-3), but for those still open, the same procedures for identification, evaluation, and protection described in Section 4.15.1 would apply to these parcels involving records searches, field inventories, and consultation with tribes where warranted based on expectations and past disturbance patterns. Therefore, the potential impacts and BMPs and SOPs for these lease areas would be similar to those discussed for the larger Planning Area.

4.15.5 Impacts of Alternative C

Alternative C consists of approximately 368,800 acres open for development with CSU stipulations and 29,800 acres open with NSO. This area is 55 percent the amount in Alternative A. As a result, potential oil and gas development activities (i.e., 37 wells and 206 acres of surface disturbance) would be more concentrated than in Alternatives A, E and F, but much less concentrated than Alternatives B and D. The BMPs and SOPs and potentially resulting mitigation identified for Alternative A would remain the same for Alternative C.

Leases Subject to Settlement Agreement

Cultural sites can potentially occur in parcels that have not been completely inventoried for the presence of cultural sites. Some yet to be identified cultural resources may be determined significant and qualify for consideration under the NHPA or spiritually important. The same procedures for identification, evaluation, and protection described in Section 4.15.1 would apply to these 14 leases involving records searches, field inventories, and consultation with tribes where warranted based on expectations and past disturbance patterns. Therefore, the potential impacts and BMPs and SOPs for these lease areas would be similar to those discussed for the larger Planning Area.

4.15.6 Impacts of Alternative D

Alternative D consists of 121,200 acres open for development with CSU stipulations and 16,400 acres open with NSO. This area is about 14 percent the amount in Alternative A. As a result, potential oil and gas development activities (i.e., 37 wells and 206 acres of surface disturbance) would be considerably more concentrated than in Alternatives A, C, E, and F. The BMPs and SOPs and potentially resulting mitigation identified for Alternative A would remain the same for Alternative D.

Leases Subject to Settlement Agreement

Cultural sites can potentially occur in parcels that have not been completely inventoried for the presence of cultural sites. Some yet to be identified cultural resources may be determined significant and qualify for consideration under the NHPA or spiritually important. For those parcels still available for leasing under this alternative (see Table 2-3), the same procedures for identification, evaluation, and protection described in Section 4.15.1 would apply to these parcels involving records searches, field inventories, and consultation with tribes where warranted based on expectations and past disturbance patterns. Therefore, the potential impacts and BMPs and SOPs for these lease areas would be similar to those discussed for the larger Planning Area.

4.15.7 Impacts of Alternative E

Alternative E consists of 487,200 acres open for development with CSU stipulations and 206,400 acres open with NSO. This area is 96 percent the amount in Alternative A. As a result, potential oil and gas development activities (i.e., 37 wells and 206 acres of surface disturbance) would be concentrated about the same. The BMPs and SOPs and potentially resulting mitigation identified for Alternative A would remain the same for Alternative E.

Leases Subject to Settlement Agreement

Cultural sites can potentially occur in parcels that have not been completely inventoried for the presence of cultural sites. Some yet to be identified cultural resources may be determined significant and qualify for consideration under the NHPA or spiritually important. For those parcels still available for leasing under this alternative (see Table 2-3), the same procedures for identification, evaluation, and protection described in Section 4.15.1 would apply to these parcels involving records searches, field inventories, and consultation with tribes where warranted based on expectations and past disturbance patterns. Therefore, the potential impacts and BMPs and SOPs for these lease areas would be similar to those discussed for the larger Planning Area.

4.15.8 Impacts of Alternative F

Alternative F consists of 683,100 acres open for development with CSU stipulations and 42,400 acres open with NSO. This area is approximately the same amount in Alternative A. As a result, potential oil and gas development activities would be concentrated about the same as Alternatives A and E, and substantially less than Alternatives B, C, and D. The BMPs and SOPs and potentially resulting mitigation identified for Alternative A would remain the same for Alternative F.

Leases Subject to Settlement Agreement

Cultural sites can potentially occur in parcels that have not been completely inventoried for the presence of cultural sites. Some yet to be identified cultural resources may be determined significant and qualify for consideration under the NHPA or spiritually important. The same procedures for identification, evaluation, and protection described in Section 4.15.1 would apply to these 14 leases involving records searches, field inventories, and consultation with tribes where warranted based on expectations and past disturbance patterns. Therefore, the potential impacts and BMPs and SOPs for these lease areas would be similar to those discussed for the larger Planning Area.

4.16 Paleontological Resources

This section analyzes the potential impacts of six alternatives for the Central Coast Oil and Gas Leasing and Development RMPA/EIS for the CCFO Planning Area, including the Leases Subject to Settlement Agreement. The management goals for paleontological resources under the 2007 Proposed RMP also apply to this RMPA/EIS. The goals aim to:

(1) preserve, protect and manage fossilized vertebrates, noteworthy invertebrates, and plants in accordance with existing laws and regulations for current and future generations;
(2) facilitate the appropriate scientific, educational, and recreational uses of paleontological resources such as research and interpretation;
(3) accommodate permit requests for scientific research by qualified individuals or institutions; and
(4) ensure proposed land uses do not destroy or damage paleontological resources (BLM, 2007).

4.16.1 Introduction

The loss of any identifiable fossil that could yield information important to prehistory, or that embodies the distinctive characteristics of a type of organism, environment, period of time, or geographic region, would be an adverse environmental impact. Direct impacts on paleontological resources primarily concern the potential destruction of non-renewable paleontological resources and the loss of information associated with these resources. This includes the unauthorized collection of fossil remains.

At the project-specific level, adverse impacts can be minimized through the implementation of paleontological mitigation, including systematic identification, documentation, curation, avoidance, or protection from damage or destruction. Mitigation of adverse impacts to paleontological resources is consistent with the purpose of the PRPA (16 USC 470aaa et seq.) and other pertinent regulations, as discussed in Section 3.16.2.

Approach to Impact Assessment

In general, for Federal mineral estate within the bounds of oil and gas fields which are underlain by paleontologically sensitive geologic units (i.e., PFYC 3-5, including Class U), the greater the amount of ground disturbance, the higher the potential for adverse impacts to paleontological resources. For those areas directly underlain by geologic units with very low to low paleontological sensitivity (i.e., PFYC 1-2), there is low to negligible potential for impacts on paleontological resources unless sensitive geologic units which underlie the marginally sensitive unit(s) are also impacted.

Direct impacts result from ground-disturbing activities related to oil and gas development. These impacts occur at the same time and place as the surface disturbing action. The potential for direct impacts on scientifically important surface and subsurface fossils in fossiliferous sedimentary deposits is controlled by two factors:

(1) the depth and lateral extent of disturbance of fossiliferous bedrock and/or surficial sediments; and
(2) the depth and lateral extent of occurrence of fossiliferous bedrock and/or surficial sediments beneath the surface.

Ground disturbance has the potential to adversely affect an unknown quantity of fossils that may occur on or underneath the surface in areas containing paleontologically sensitive geologic units. Without mitigation, these fossils, as well as the paleontological data they could provide if properly salvaged and documented, could be adversely affected (destroyed), rendering them permanently unavailable for future scientific research.

Indirect impacts occur later in time or further away in distance than direct impacts, but are still reasonably foreseeable. They typically include those impacts which result from the normal ongoing operations of

facilities constructed within a given project area. An example of an indirect adverse impact on paleontological resources would be the construction of a new road that increases public access to a previously inaccessible area, which results in unauthorized fossil collecting (i.e., poaching) and vandalism. Mitigation strategies could include periodic surveys by qualified paleontologists to collect significant surface fossils, transfer them to a public museum, and identify locations of fossil localities in the vicinity that have the potential to yield additional fossils as erosion occurs, and the construction of protective fencing or other barriers around known paleontological localities.

BLM is unable to quantify impacts on paleontological resources from the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.16. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects on paleontological resources from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground. Other incomplete or unavailable information includes the type(s) of development(s) and site-specific resource conditions because it's impossible for BLM to know how, where, or when leases would be developed.

A comprehensive survey of the Planning Area is not feasible, or reliable, because the timing, intensity, and/or location of future leasing and development activities is unknown. Therefore, BLM is unable to quantify effects on paleontological resources under the range of alternatives. As a result, the evaluation of such impacts considers current resource conditions described in Section 3.16, and the regulatory framework described in Appendix J.

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of federal minerals in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99 percent) of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects on paleontological resources in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

Assumptions

As described in Section 3.16.1, geologic units are considered "sensitive" if they are known to contain scientifically important paleontological resources anywhere in their extent. The area of sensitivity is typically defined as the entire rock unit (formation or member thereof) and is not limited to areas where surface fossils may be exposed. Using the BLM's (2016) PFYC sensitivity classification system, the major fossil-bearing units underlying the CCFO Planning Area were assigned a preliminary PFYC classification (i.e., sensitivity) based on the programmatic assessment in Chapter 3 (Affected Environment). These PFYC assignments are subject to revision and refinement as additional information becomes available.

The 2007 RMP set forth management actions for the protection of paleontological resources within the CCFO Planning Area (BLM, 2007). Many of those actions are assumed to be appropriate for the mitigation of adverse impacts to paleontological resources that occur as the result of oil and gas development activities. These Management Actions are described below.

Paleontology Management Actions – Inventory, Monitoring, Avoidance

The BLM instituted guidance for the management of paleontological resources (BLM, 1998a, 1998b, 2008, 2016). In accordance with this guidance, in order to determine the paleontological sensitivity and impact potential for a given oil and gas development project, the appropriate CCFO representative must establish, in consultation with the BLM California State Office paleontologist, whether an inventory shall be conducted. The inventory, which would be performed by a qualified paleontologist and approved by BLM, would set forth PFYC and mitigation recommendations for the project. The final PFYC determination would be made by an authorized BLM officer. If a PFYC 3-5 area is identified during the inventory, impacts from oil and gas development activities could be mitigated to an acceptable level with appropriate measures provided in BLM (1998a, 1998b, 2008, 2016) guidance documents. Measures may include the creation of a buffer, avoidance, construction monitoring procedures, and curation, as specified in the required permitting documents associated with energy and minerals or other land use authorizations (BLM, 2016).

Paleontology Management Actions – Preservation

The establishment of an Area of Critical Environmental Concern (ACEC) is a management strategy that promotes the preservation of paleontological resources. The Panoche-Coalinga ACEC is an example of a region in the CCFO Planning Area that has been set aside to protect paleontological resources that have particularly important scientific significance. Preservation, as defined in this RMPA/EIS, also includes accommodating permits for scientific research and protecting paleontological resources from inadvertent damage. The Paleontology Management Actions are outlined in Table 4.16-1.

Table 4.16-1. Summary of Paleontological Resources Management Actions for the RMPA Alternatives

Type of Preservation	Management Actions
Buffer around paleontological sites	Construct a 300-foot buffer to protect paleontological resources from inadvertent impacts or disturbance. (PALEO-C1)
Avoidance of disturbance	Protect all resources from inadvertent impacts from proposed land uses, including oil and gas development. (PALEO-COM2). This may include the temporary installation of temporary fences along margins of pad sites on oil and gas developments to eliminate off-site project-related vehicle impacts on undisturbed areas. (PALEO-C2).
Site-specific mitigation: reconnaissance survey, construction monitoring, recovery, and curation	Reduce adverse impacts to paleontological resources through site-specific mitigation procedures such as surveying, construction monitoring, resource recovery and curation. (PALEO-C2)
Preservation	Accommodate permit requests for scientific studies issued by the State office and preserve all significant fossil resources by avoidance, fossil recovery, or stabilize soils from erosion; establishment of ACEC. (PALEO-COM1 and PALEO-C3)

Source: BLM, 2007

Best Management Practices and Standard Operating Procedures

Best Management Practices (BMPs) and Standard Operating Procedures (SOPs) for the CCFO Planning Area are provided in Appendix D. The practices and procedures most relevant to the treatment of paleontological resources are provided below.

The following BMPs will be applied to all BLM undertakings and authorizations:

- No construction or surface-disturbing activities shall occur without prior written authorization of the authorized BLM officer.

- Surface disturbance will be minimized. Project applicants will be encouraged to utilize previously disturbed sites when feasible.
- Authorizations for new surface-disturbing activities will place priority on avoiding impacts to paleontological resources. Avoidance will employ measures such as relocation of project sites, modifying construction techniques, and altering project timing.
- Delineate work area boundaries with flagging, temporary fencing, or other marking to minimize surface disturbance or impacts on sensitive paleontological resources.
- When necessary to protect sensitive paleontological resources, monitoring by BLM-approved paleontologists shall be required during construction activities.
- Avoid soil-disturbing activities during periods of high rainfall and runoff or when soils are wet and muddy in order to minimize impacts to paleontological resources.
- Any discovery of a paleontological resource during a project would be reported to the authorized officer. All activity in the immediate discovery area associated with the project would be suspended until an evaluation of the discovery is made by the BLM-approved paleontologist to determine appropriate actions to prevent the loss of significant paleontological or scientific values. A written authorization to resume the project, or to take appropriate mitigation action, would be issued by the authorized BLM officer.
- It is the policy of the BLM (1) to avoid impacts on scientifically important paleontological resources whenever possible and (2) to avoid inadvertent loss or destruction of paleontological resources by BLM actions or authorizations.

Other Management Actions

Paleontological resources would benefit from soil resource management actions that control erosion and avoid surface disturbance on steep slopes or during wet periods. Due to high erosion rates on steep slopes in the CCFO Planning Area, soil resource management actions would reduce potential impacts to significant paleontological resources from moderate and minor to negligible and would cause a beneficial impact by mitigating the constant exposure of subsurface materials, including new fossils. If exposed for long periods of time, these fossils would erode from the confining sediments and gradually deteriorate. Management actions, such as installing temporary fences, maintaining buffer zones, relocating resources, and stabilizing and rehabilitating soils, would help mitigate erosion and prevent inadvertent damage or exposure of paleontological resources.

4.16.2 Impacts Common to All Alternatives

The Reasonably Foreseeable Development (RFD) Scenario for oil and gas in the CCFO Planning Area identifies a number of potential actions that could result in adverse impacts to paleontological resources due to oil and gas development. The RFD Scenario states that between zero and 32 development wells and three to five exploratory wells could be expected over 15 to 20 years on Federal mineral estate. Associated with these wells are certain levels of surface disturbing work, including well pads (1 to 3 acres per well), roads (40 feet wide and 4.8 miles long per well location), pipeline installation (20 feet wide corridor and 0 to 10 miles in length), and related facilities (zero to eight facilities at 1 acre per facility). The RFD Scenario also identifies up to 34 miles of seismic exploration work. Overall, the RFD Scenario projects include between 22.45 and 205.7 acres of disturbance. Well stimulation treatment operations are expected to occur entirely within the well pad disturbance area but would increase vehicle presence involving control vans, pump trucks, a flatbed truck, a tanker, crane water trucks, sand trucks, and a manifold/treating iron trailer. An assumption of this analysis is that the same level of activity is associated with each of the six alternatives identified in Chapter 2.

The potential to discover paleontological resources during activities related to oil and gas development under the six RMPA alternatives in the CCFO Planning Area ranges from low to high based on the location relative to fossil-bearing geologic units, of ground-disturbing activities. The amount of ground disturbance would likely be greatest for new well pads, especially within areas outside of existing fields, as well as site preparation and grading, excavations of pit and sumps, grading of access roads, well drilling, pipeline construction, geophysical exploration, and ancillary facility construction. Well stimulation technologies, such as hydraulic fracturing and acid matrix stimulation, have a low to negligible potential to adversely impact paleontological resources because:

(1) only limited new surface-disturbing activities (e.g., staging areas or temporary access roads and facilities for wastewater) are expected to result from these activities;

(2) subsurface hydraulic fracturing is considered to have a negligible effect to paleontologically sensitive geologic units because the widths of fractures are a fraction of an inch wide; and

(3) acid matrix stimulation could theoretically destroy buried fossil resources; however, many of the reservoir rocks are deeply buried and are unlikely to be recovered within their original context.

These adverse impacts would be reduced to an acceptable level with implementation of the Mitigation and Management Actions presented above under "Assumptions."

The impacts to paleontological resources for each Alternative are described in the following sections. Alternatives A through F are each largely underlain by geologic units identified as having moderate to high paleontological sensitivity (PFYC 3 – PFYC 5). Therefore, regardless of the total acreage per alternative, the impacts for each alternative are similar.

4.16.3 Impacts of Alternative A (No Action)

Alternative A includes approximately 683,800 acres of Federal mineral estate in the CCFO Planning Area open for oil and gas leasing with CSU stipulations and 41,700 acres open and subject to NSO lease stipulations. According to geologic mapping by Jennings and Strand (1958) and Wagner et al. (1991), Alternative A is underlain by 24 of the 31 major significant fossil-bearing geologic units described in Chapter 3 (Affected Environment). These units include the Franciscan Assemblage, Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Avenal Sandstone, Kreyenhagen Formation, Markley Formation, Temblor Formation, Vaqueros Formation, Monterey Group, San Pablo Group, Oro Loma Formation, Santa Margarita Formation, Santa Cruz Mudstone, Jacalitos Formation, Purisima Formation, Etchegoin Formation, San Benito Gravels, Paso Robles Formation, Tulare Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3 to 5.

The potential to encounter paleontological resources during oil and gas development within Federal mineral estate under Alternative A ranges from low to high based on the location of ground-disturbing activities. Oil and gas leases within Federal mineral estate under Alternative A would be subject to construction-related ground disturbances such as site and well pad preparation, excavations of pit and sumps, grading of access roads, well drilling, and ancillary facility construction associated with oil and gas development.

The adverse impacts to paleontological resources under Alternative A would be reduced with implementation of the Paleontology Management Actions, BMPs and SOPs, as described in Section 4.16.1.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A, BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and Hollister II, are underlain by 12 of the 31 major fossil-bearing geologic units described in Chapter 3 (Affected Environment). As listed in Table 3.16-2, these units include the Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation,

Kreyenhagen Formation, Temblor Formation, Monterey Group, Oro Loma Formation, Paso Robles Formation, and Quaternary Older Alluvium, which have a sensitivity classification ranging from PFYC 3 to 5. The potential impacts for these lease areas would be similar to those discussed for the larger Planning Area. Adverse impacts to paleontological resources within the non-NSO leases would be reduced with implementation of the BMPs, SOPs and Paleontology Management Actions as described in Section 4.16.1.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no paleontological resource impacts would occur.

4.16.4 Impacts of Alternative B

Alternative B includes approximately 39,000 acres of Federal mineral estate in the CCFO Planning Area open for oil and gas leasing with CSU stipulations. According to geologic mapping by Jennings and Strand (1958) and Wagner et al. (1991), Alternative B is underlain by 23 of the 31 major significant fossil-bearing geologic units described in Chapter 3 (Affected Environment). These units include the Franciscan Assemblage, Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Markley Formation, Temblor Formation, Vaqueros Formation, Monterey Group, San Pablo Group, Oro Loma Formation, Santa Margarita Formation, Santa Cruz Mudstone, Jacalitos Formation, Purisima Formation, Etchegoin Formation, San Benito Gravels, Paso Robles Formation, Tulare Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3 to 5.

The potential to discover paleontological resources during oil and gas development within Federal mineral estate under Alternative B ranges from low to high based on the location of ground-disturbing activities. Oil and gas leases within Federal mineral estate under Alternative B would be subject to construction-related ground disturbances such as site and well pad preparation, excavations of pit and sumps, grading of access roads, well drilling, and ancillary facility construction associated with oil and gas development.

The adverse impacts to paleontological resources under Alternative B would be reduced to an acceptable level with implementation of the Paleontology Management Actions, BMPs and SOPs, as described in Section 4.16.1.

Leases Subject to Settlement Agreement

Under Alternative B, BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and Hollister II, are underlain by 12 of the 31 significant fossil-bearing geologic units described in Chapter 3 (Affected Environment). As listed in Table 3.16-2, the units include the Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Monterey Group, Oro Loma Formation, Paso Robles Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3 to 5. Under Alternative B, the majority of BLM-managed mineral estate that contain the 14 non-NSO leases would be closed to leasing. The potential impacts for these lease areas would be similar to those discussed for the larger Planning Area. If new wells were drilled in the open areas over the next 15 to 20 years, adverse impacts to paleontological resources within the non-NSO leases would be reduced to an acceptable level with implementation of the Paleontology Management Actions, BMPs and SOPs, as described in Section 4.16.1.

4.16.5 Impacts of Alternative C

Alternative C includes approximately 368,800 acres of Federal mineral estate in the CCFO Planning Area open for oil and gas leasing with CSU stipulations and 29,800 acres open and subject to NSO lease

stipulations. According to geologic mapping by Jennings and Strand (1958) and Wagner et al. (1991), Alternative C is underlain by 22 of the 31 major fossil-bearing geologic units described in Chapter 3 (Affected Environment). These units include the Franciscan Assemblage, Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Markley Formation, Temblor Formation, Vaqueros Formation, Monterey Group, San Pablo Group, Oro Loma Formation, Santa Margarita Formation, Jacalitos Formation, Purisima Formation, Etchegoin Formation, San Benito Gravels, Paso Robles Formation, Tulare Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3 to 5.

The potential to encounter paleontological resources during oil and gas development within Federal mineral estate under Alternative C ranges from low to high based on the location of ground-disturbing activities. Oil and gas leases within Federal mineral estate under Alternative C would be subject to construction-related ground disturbances such as site and well pad preparation, excavations of pit and sumps, grading of access roads, well drilling, and ancillary facility construction associated with oil and gas development.

The adverse impacts to paleontological resources under Alternative C would be reduced to an acceptable level with implementation of the Paleontology Management Actions, BMPs and SOPs, as described in Section 4.16.1.

Leases Subject to Settlement Agreement

Under Alternative C, BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and Hollister II, are underlain by 12 of the 31 major fossil-bearing geologic units described in Chapter 3 (Affected Environment). As listed in Table 3.16-2, the units include the Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Monterey Group, Oro Loma Formation, Paso Robles Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3 to 5. The potential impacts for these lease areas would be similar to those discussed for the larger Planning Area. Adverse impacts to paleontological resources within the non-NSO leases would be reduced with implementation of the Paleontology Management Actions, BMPs and SOPs, as described in Section 4.16.1.

4.16.6 Impacts of Alternative D

Alternative D includes approximately 121,200 acres of Federal mineral estate in the CCFO Planning Area open for oil and gas leasing with CSU stipulations and 16,400 acres open and subject to NSO lease stipulations. According to geologic mapping by Jennings and Strand (1958) and Wagner et al. (1991), Alternative D is underlain by 21 of the 31 major significant fossil-bearing geologic units described in Chapter 3 (Affected Environment). These units include the Franciscan Assemblage, Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Vaqueros Formation, Monterey Group, San Pablo Group, Oro Loma Formation, Santa Margarita Formation, Jacalitos Formation, Purisima Formation, Etchegoin Formation, San Benito Gravels, Paso Robles Formation, Tulare Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3 to 5.

The potential to encounter paleontological resources during oil and gas development within Federal mineral estate under Alternative D ranges from low to high based on the location of ground-disturbing activities. Oil and gas leases within Federal mineral estate under Alternative D would be subject to construction-related ground disturbances such as site and well pad preparation, excavations of pit and sumps, grading of access roads, well drilling, and ancillary facility construction associated with oil and gas development.

The adverse impacts to paleontological resources under Alternative D would be reduced to an acceptable level with implementation of the Paleontology Management Actions, BMPs and SOPs, as described in Section 4.16.1.

Leases Subject to Settlement Agreement

Under Alternative D, BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and Hollister II, are underlain by 12 of the 31 major fossil-bearing geologic units described in Chapter 3 (Affected Environment). As listed in Table 3.16-2, the units include the Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Monterey Group, Oro Loma Formation, Paso Robles Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3 to 5. Under Alternative D, the majority of BLM-managed mineral estate that contain the 14 non-NSO leases would be closed to leasing. Potential impacts for these lease areas would be similar to those discussed for the larger Planning Area. If new wells were drilled in the open areas over the next 15 to 20 years, adverse impacts to paleontological resources within the non-NSO leases would be reduced with implementation of the Paleontology Mitigation and Management Actions, BMPs and SOPs, as described in Section 4.16.1.

4.16.7 Impacts of Alternative E

Alternative E includes approximately 487,200 acres of Federal mineral estate in the CCFO Planning Area open for oil and gas leasing with CSU stipulations and 206,400 acres open and subject to NSO lease stipulations. According to geologic mapping by Jennings and Strand (1958) and Wagner et al. (1991), Alternative E is underlain by 22 of the 31 major significant fossil-bearing geologic units described in Chapter 3 (Affected Environment). These units include the Franciscan Assemblage, Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Markley Formation, Temblor Formation, Vaqueros Formation, Monterey Group, San Pablo Group, Oro Loma Formation, Santa Margarita Formation, Jacalitos Formation, Purisima Formation, Etchegoin Formation, San Benito Gravels, Paso Robles Formation, Tulare Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3 to 5.

The potential to encounter paleontological resources during oil and gas development within Federal mineral estate under Alternative E ranges from low to high based on the location of ground-disturbing activities. Oil and gas leases within Federal mineral estate under Alternative E would be subject to construction-related ground disturbances such as site and well pad preparation, excavations of pit and sumps, grading of access roads, well drilling, and ancillary facility construction associated with oil and gas development.

The adverse impacts to paleontological resources under Alternative E would be reduced to an acceptable level with implementation of the Paleontology Management Actions, BMPs and SOPs, as described in Section 4.16.1.

Leases Subject to Settlement Agreement

Under Alternative E, BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and Hollister II, are underlain by 12 of the 31 major fossil-bearing geologic units described in Chapter 3 (Affected Environment). As listed in Table 3.16-2, the units include the Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Monterey Group, Oro Loma Formation, Paso Robles Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3 to 5. Under Alternative E, 10,000 acres of Federal mineral estate that contain the 14 non-NSO leases would be open to leasing, with 400 acres closed and 7,200 acres open with NSO stipulations. Potential impacts for these lease areas would be similar to those discussed for the larger Planning Area. If new wells are drilled in the open areas over the next 15 to 20 years, adverse impacts to paleontological resources within the non-NSO leases would be reduced with implementation of the Paleontology Management Actions, BMPs and SOPs, as described in Section 4.16.1.

4.16.8 Impacts of Alternative F

Alternative F includes approximately 683,100 acres of Federal mineral estate in the CCFO Planning Area open for oil and gas leasing with CSU stipulations and 42,400 acres open and subject to NSO lease stipulations. According to geologic mapping by Jennings and Strand (1958) and Wagner et al. (1991), the Federal mineral estate open with CSU stipulations in Alternative F is underlain by 20 of the 31 major significant fossil-bearing geologic units described in Chapter 3 (Affected Environment). These units include the Franciscan Assemblage, Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Vaqueros Formation, Monterey Group, Oro Loma Formation, Santa Margarita Formation, Jacalitos Formation, Purisima Formation, Etchegoin Formation, San Benito Gravels, Paso Robles Formation, Tulare Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3 to 5.

The potential to encounter paleontological resources during oil and gas development within Federal mineral estate under Alternative F ranges from low to high based on the location of ground-disturbing activities. Oil and gas leases within Federal mineral estate under Alternative F would be subject to construction-related ground disturbances such as site and well pad preparation, excavations of pit and sumps, grading of access roads, well drilling, and ancillary facility construction associated with oil and gas development.

The adverse impacts to paleontological resources under Alternative F would be reduced to an acceptable level with implementation of the Paleontology Management Actions, BMPs and SOPs, as described in Section 4.16.1.

Leases Subject to Settlement Agreement

Under Alternative F, BLM-managed areas that contain the 14 non-NSO leases, as identified in Hollister I and Hollister II, are underlain by 14 of the 31 major fossil-bearing geologic units described in Chapter 3 (Affected Environment). As listed in Table 3.16-2, the units include the Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Vaqueros Formation, Etchegoin Formation, San Benito Gravels, Paso Robles Formation, Tulare Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3 to 5. Under Alternative F, the BLM-managed mineral estate that contain the 14 non-NSO leases would be open to leasing with CSU stipulations. Potential impacts for these lease areas would be similar to those discussed for the larger Planning Area. If new wells were drilled in the open areas over the next 15 to 20 years, adverse impacts to paleontological resources within the non-NSO leases would be reduced with implementation of the Paleontology Mitigation and Management Actions, BMPs and SOPs, as described in Section 4.16.1.

4.17 Social and Economic Conditions

4.17.1 Introduction

This section presents an analysis of social and economic impacts of the management alternatives proposed as part of the Central Coast Oil and Gas Leasing and Development RMPA. Each alternative is evaluated in light of oil and gas extraction forecasts for Federal mineral estate in the 2015 Reasonably Foreseeable Development (RFD) Scenario over the 15- to 20-year period of analysis. This analysis discusses potential effects to existing social patterns, employment, labor income, and sectors in the impact area economy that encompass the Central Coast Field Office (CCFO), with an emphasis on the areas designated as having high potential for oil and gas development shown in Figure 5-1. Environmental justice impacts to communities within the localized study area are also discussed.

The social analysis focuses on the interests and concerns of identified communities relative to the alternatives, particularly those identified during the Social and Economic Workshop held on February 4, 2015 (included as Appendix F of this EIS). The economic analysis focuses on the potential for RMPA alternatives to result in changes to the local economies affected by the oil and gas industry associated with the 2015 RFD Scenario by alternative (refer to Table 2-1). Continued employment patterns can be seen as a benefit to the local community. Other economic benefits are also present, although some are not easily measured or tied to economic activity. An example of where effects are difficult to quantify are equity effects, impacts to social values, and non-market values. Regardless, these are discussed at qualitative and programmatic level despite the inability to measure them quantitatively.

Methods of Analysis

In order to accurately portray the relationship of current BLM management and the community, the social and economic geographic scope of analysis must be defined. The social and economic effects from changes on Federal mineral estate feasibly extend beyond the immediate vicinity of their location. However, based on the information provided in Section 2.3, overall, the 2015 RFD Scenario assumes that the current development trends in this region are likely to continue for the next 15 to 20 years. It is estimated that during the life of this RMPA, 37 total exploratory and development wells would be developed on up to 206 acres. This estimate includes all anticipated forms of ground disturbance such as the construction of well pads, roads, onsite facilities, and pipelines. Well stimulation technologies (e.g., hydraulic fracturing, acid matrix stimulation, acid fracturing) and enhanced oil recovery techniques (e.g., cyclic steam, steam flood, water flood) may be used on any or all of the 37 wells during their life cycle.

When considering the existing oil and gas industry within the CCFO Planning Area, the local study area for social and economic impacts includes the portions of Fresno, Monterey, and San Benito Counties that encompass the area of high oil and gas occurrence potential shown in Figure 5-1. The local study area includes communities proximate to existing oil and gas development: the City of Coalinga (Fresno County), the cities of Greenfield and Kings City (Monterey County), and the communities of Bradley, San Ardo, and San Lucas (Monterey County). These local study area communities are also those identified as potentially affected social groups during the Social and Economic Workshop held on February 4, 2015 (see Appendix F).

The programmatic analysis within this chapter is primarily qualitative and based on a set of indicators and attributes (many of which were identified in Section 3.17 for existing conditions). The analysis of oil and gas development effects on social and economic conditions is based on the following indicators:

- Demographic conditions in the regional and local study areas;
- Social conditions within the regional and local study areas pertaining to the oil and gas industry;
- Economic conditions in the regional and local study areas; and

The analysis of oil and gas development effects on social and economic conditions is based on the following attributes:

- Direct oil and gas-related employment;
- Secondary jobs related to oil and gas;
- Total population in regional and local study areas and population by location;
- Direct and indirect revenue resulting from the BLM-managed activities;
- Direction, magnitude and rate of change in social and economic conditions; and
- Geographic concentration of land use, demographic, and economic changes.

Environmental justice impacts are evaluated by identifying populations, communities or groups that contain a high number of minority or low-income population (based on the data presented in Section 3.17) that could be subject to disproportionate adverse effects of BLM oil and gas management actions identified for RMPA alternatives.

BLM is unable to quantify impacts on social and economic conditions from the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.17. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects on social and economic conditions from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground. Other incomplete or unavailable information includes the type(s) of development(s) and site-specific resource conditions because it's impossible for BLM to know how, where, or when leases would be developed. BLM is unable to quantify effects on housing, employment, tax revenue, or environmental justice under the range of alternatives. As a result, the evaluation of such impacts considers current resource conditions described in Section 3.17, and the regulatory framework described in Appendix J.

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of Federal mineral estate in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99 percent) of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects on social and economic conditions in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

Assumptions

The following assumptions were used to complete the analysis for social and economic impacts from the proposed RMPA:

- Future environmental analyses would be conducted, as appropriate, for project- and site-specific actions proposed in the CCFO Planning Area administrative boundary. Applications for Permit to Drill would address potential social and economic effects of oil and gas development on identified affected communities.
- Social and economic effects are based on the assumption of full implementation of the 2015 RFD Scenario on the varying BLM land designations allowing for leases on BLM-administered mineral estate by alternative.

- As described in Section 2.5.2, the same range of oil and gas development under the 2015 RFD Scenario (i.e., up to 37 exploratory and development wells on up to 206 acres of disturbance) would apply to all alternatives except Alternative B, which would include only up to 32 wells drilled.
- All surface-disturbing activities related to the 2015 RFD Scenario would most likely occur on BLM-administered mineral estate in Fresno, Monterey, and San Benito Counties within the area of high oil and gas occurrence potential (shown in Figure 5-1) for the CCFO Planning Area but may potentially occur anywhere that is open to oil and gas leasing.
- New oil and gas well locations developed under the 2015 RFD Scenario would most likely be within, or proximate to, established producing oil and gas fields or near lands that are already leased for such activities but may potentially occur anywhere that is open to oil and gas leasing.
- Development of ancillary oil and gas facilities (e.g., pipelines, compressor stations, etc.) are assumed to be proportional to number of new wells developed. A total of 37 exploratory and development wells under the 2015 RFD Scenario would primarily utilize existing pipeline infrastructure and refineries.

4.17.2 Impacts Common to All Alternatives

Oil and Gas Development Social Effects

As discussed in Section 2.3, under the 2015 RFD Scenario a maximum of 37 exploratory and development wells would occur on new Federal oil and gas leases over the next 15 to 20 years. As discussed in Section 3.17 (Table 3.17-2), active oil and gas wells on Federal mineral estate account for only 110 (0.6%) of the total 18,229 active wells within the CCFO Planning Area. The increase of 37 new wells occurring under the 2015 RFD Scenario for all alternatives would continue to account for a negligible number of total wells within the CCFO Planning Area occurring on Federal mineral estate.

It is likely that current oil and gas companies operating within the CCFO Planning Area would undertake all new wells. Therefore, the 2015 RFD Scenario is not expected to create a significant number of new jobs or induce population to new lease areas from employment. However, any new amount of long-term direct or indirect job creation and associated population in-migration that may occur at this programmatic scale would depend on the number of new wells created and frequency of stimulation treatments at existing wells (as a result of RMPA approval).

Employment

Changes in employment patterns within a community can have a direct and indirect effect on many social conditions. Because both the regional and local study areas contain significant existing oil and gas development, when considering the oil and gas activities occurring under the 2015 RFD Scenario for all alternatives, one key component to analyze for social and economic effects is any change in employment patterns or levels. The development of an individual well and potential stimulation activities do not typically require large numbers of on-site employees for extended periods. Table 4.17-1 provides a summary of typical workforce and timeline for well development and stimulations.

Table 4.17-1. Typical Oil and Gas Well Development and Stimulation Treatment in California

Oil and Gas Activity	Timeline	Workforce
Oil and Gas Well Development	Exploration: 3–5 years Planning: 1–1.5 years Site and well construction: 2–3 months Well completion: 1–2 days	8-10 Persons
Well Stimulation Treatment	Total stimulation treatment: 10 days Total work hours: 16 Work hours per stage (up to 5 stages):[1] 30–60 minutes	2-5 Persons

1 - Within the Monterey Formation, wells are expected to be much deeper, with up to 20 hydraulic fracturing stages executed.
Source: DOC, 2015

During well development, exploration and planning activities occur temporarily during the 3- to 5-year and 1- to 1.5-year timeframes shown in Table 4.17-1, respectively. For both well and well stimulation activities, with the exception of any specialized labor needs, it is likely any new employees necessary for creation of new wells would already be residents in the regional or local study areas and are not expected to contribute to an increase or change in population or demographic makeup. New well development and stimulation activities occurring under the 2015 RFD Scenario within an existing oil and gas field, or at new locations, would not all occur at the same time. Therefore, workforce needs would fluctuate. Wells are developed individually and need various services at various times. This variability and the need to schedule services would reduce the potential for new employment and associated worker in-migration, as employers would first make efficient use of existing employees. Therefore, the oil and gas activities and well development intensity identified under the 2015 RFD Scenario would not introduce new population at a level that could adversely alter existing or projected population, housing demand, or demographic makeup of affected communities.

Social Disruption

As discussed within Section 3.17, the southern portion of the CCFO Planning Area has a number of well-established oil and gas fields and development areas that have shaped the social landscape of communities located proximate to them. The development of new wells and stimulation treatments under the 2015 RFD Scenario are expected to occur within or proximate to these existing fields within the CCFO Planning Area. Therefore, the oil and gas activities and well development intensity identified under the 2015 RFD Scenario would not introduce any new activities or industry that could adversely impact or change the existing social framework of affected local communities.

With such a relatively small labor force needed for a typical well development and stimulation treatment, minimal long-term population in-migration from new employment is expected. It is possible some specialized workers could come from outside the regional and local study areas. However, these workers are expected to seek lodging proximate to the work areas, which is assumed to be local study area communities where social values and structure is already influenced by the oil and gas industry. Therefore, the presence of temporary oil and gas workers is not expected to disrupt existing social conditions or values of affected communities. While some CCFO Planning Area community interests likely would consider continued energy development to diminish quality of life, it is assumed the local study area communities identified in Section 3.17, Table 3.17-3, would not due to their communities developing with a continued oil and gas industry presence.

Oil and Gas Development Economic and Fiscal Effects

The oil and gas activities and well development intensity identified under the 2015 RFD Scenario would include the continued use of drilling-related employees of the energy development companies operating in the CCFO Planning Area and subcontract workers primarily in the oil and gas and construction industries. In addition to direct jobs associated with drilling and operating oil and gas wells and related infrastructure, oil- and gas-related economic activity would support other secondary jobs established in the local communities. These jobs result from:

- Both indirect economic effects of oil and gas activity (purchases of goods and services by energy companies and their subcontractors)
- Induced economic effects (purchases of household goods by the employees of energy companies, subcontractors and indirectly affected firms).

Based on the data shown in Section 3.17, the greatest proportion of secondary jobs currently occur within the local study area (Monterey County, Fresno County, and San Benito County) and local study area communities (Coalinga, Greenfield, King City, Bradley CDP, San Ardo CDP, and San Lucas CDP) due to extensive oil and gas activity in the area of high oil and gas occurrence potential within the CCFO Planning

Area. The local study areas discussed in Table 3.17-3 represent the areas where a number of oil and gas workers are expected to reside and direct and indirect economic effects are prevalent. The continued direct and indirect economic effects from oil and gas activities and worker wages and spending under the 2015 RFD Scenario is considered a beneficial impact, particularly within local study area communities that have established economies influenced by oil and gas activities.

Table 3.17-4 summarizes recent economic and fiscal contributions of the oil and gas industry within Monterey County, Fresno County, and San Benito County (local study area) where new oil and gas wells developed under the 2015 RFD Scenario would most likely be located within. As shown in Table 3.17-4, as the number of total oil and gas wells per county is increased, the average economic and fiscal contribution per well decreases. Therefore, new wells occurring under the 2015 RFD Scenario are estimated to have the greatest beneficial economic effect in San Benito County, second greatest in Monterey County, and less in Fresno County. However, beneficial economic effects would occur as part of each new well developed. As noted in Table 3.17-4, a number of employment sectors are included as part of the direct employment, with secondary and induced sectors incurring benefits from oil and gas development through direct employee wage spending, operations and maintenance expenditures, and through government use of tax revenue.

To varying degrees, oil and gas development involving Federal mineral estate within the CCFO Planning Area would foster economic development within affected communities. The commercially viable oil and gas resources would, however, be exhausted within a finite time period. The longer-term sustainability and viability of community investments incurred to provide housing and other public services for the direct energy workforce (and the secondary workers supported by that workforce) would depend on the ability of the affected communities to diversify the local economic base over time.

Split Estate Leases

BLM issues a number of lease types for oil and gas extraction, with leases either being competitive or non-competitive. In split estate situations, the surface rights and subsurface rights (such as the rights to develop minerals) for a piece of land are owned by different parties. The BLM's split estate policy only applies to situations where the surface rights are under private ownership and the rights to development of the mineral resources are publicly held and managed by the Federal government (in this case the BLM). In these situations, mineral rights are considered the dominant estate, meaning the owner of the mineral estate has the right to enter and occupy as much of the surface as is reasonably necessary to explore, drill, and remove the oil and natural gas resource on the leasehold, subject to obtaining the BLM's approval of the drilling and surface use plans (BLM, 2007). However, the mineral owner must conduct operations to minimize adverse effects to surface and subsurface resources and prevent any unnecessary surface disturbance (BLM, 2007).

Because split estate leases include privately owned surface lands, they can result in direct and indirect economic effects on landowners and local governments. By issuing a split estate lease, the development of oil and gas activities within the leased area can preclude the existing or planned surface land uses. While split estate leases are negotiated with the affected surface owner, they would affect revenue and taxes potentially generated by the precluded existing or planned surface land uses. Lease sales and fees generate revenue for the BLM. Split-estate leases are considered to have the greatest potential for economic effects to local jurisdictions and private parties due to land use incompatibilities and/or land use conversion. This was the primary issue raised by participants during the Social and Economic Workshop held on February 4, 2015 (see Appendix F).

Non-market Values

Non-market values are associated with several of the resources managed by the BLM in the CCFO Planning Area, as well as with recreation and open space on both public and private lands. Non-market values include the benefits received by people from participating in recreational/tourist activities and the overall

high-value visual context of these lands throughout the CCFO Planning Area. Additionally, individuals derive passive or non-use benefits from the existence of abundant wildlife, waterways, scenic resources, and extensive agricultural lands with little development and other amenities in many areas within the CCFO Planning Area. Both tourism and recreation have market components individually, which are heavily affected by BLM land use decisions within the CCFO Planning Area.

All areas currently closed to oil and gas leasing under the 2007 Hollister Field Office RMP would remain closed under all alternatives. Additionally, all areas designated as No Surface Occupancy (NSO) would further maintain and perhaps enhance non-market values associated with natural amenities protected on these lands. The BLM management decisions occurring under the existing RMP that offer more protection for the following resource categories (unchanged by the proposed amendment) provide protection for non-market values and non-quantifiable benefits:

- Special status species;
- Wild and Scenic Rivers;
- Cultural resources;
- Paleontological resources;
- Agricultural resources;
- Visual resources; and
- Recreation resources.

Oil and Gas Development Environmental Justice Effects

In analyzing potential environmental justice impacts, the U.S. Census data for minority and low-income populations in Section 3.17 was used. For this analysis, a population is considered a potential environmental justice population if the percentage of the minority or low-income population of the potentially affected area is significantly greater than the corresponding percentage of the population in the larger jurisdiction or region in which it is located. As discussed earlier, it is assumed most surface-disturbing activities related to the 2015 RFD Scenario would likely occur in Fresno, Monterey, and San Benito Counties within the area of high oil and gas occurrence potential shown in Figure 5-1 for the CCFO Planning Area. As described in Section 3.17.3, all three of these counties are considered minority areas of concern with respect to environmental justice. Both Fresno and Monterey Counties are also considered low-income areas of concern. Additionally, the development of new wells and stimulation treatments under the 2015 RFD Scenario are expected to occur within or proximate to existing oil and gas fields within the CCFO Planning Area. Based on these assumptions, the areas with potentially elevated environmental burdens from oil and gas extraction activities and vulnerable populations are the local study area communities of King City, San Ardo, and San Lucas (based on baseline data presented in Chapter 3.17, Table 3.17-3). Additionally, Coalinga is considered to have a high percentage of low-income population for consideration of environmental justice at the local study area level.

The location of existing oil and gas fields is dependent on the location and availability of underground hydrocarbon resources and the characteristics of geologic formations. The location of underground resources dictates where oil and gas wells are developed, and where well stimulation may occur. Most of the existing fields in the CCFO Planning Area are decades old, with some nearly a century old. Therefore, the presence of these oil and gas fields has been static in relation to the development and changes of the population around them. In particular, the demographic makeups of Coalinga, King City, San Ardo, and San Lucas have developed over time with nearby oil and gas fields present throughout. Activities that would occur under the 2015 RFD Scenario already occur at a greater magnitude within existing fields under existing conditions. Therefore, RMPA activities would not introduce new types of environmental impacts not already occurring from current well drilling, extraction, and stimulation treatments.

The major consideration is whether any adverse impacts from oil and gas activities under the 2015 RFD Scenario would be borne disproportionately by these communities when compared to the general population

of the region. An important aspect when considering disproportionate effects within these communities over existing conditions is the life cycle of existing oil and gas extraction. As the availability of oil and gas resources decline, production decreases. Any adverse impacts from current field activities, including well stimulations, also would decrease as compared to periods of higher oil and gas production. As most of the recoverable resource is removed, well stimulation is no longer effective in increasing flow to a level that would justify its continued use. Therefore, as new activities (and any adverse impacts) that occur under the 2015 RFD Scenario are introduced, existing activities (and any adverse impacts) would be reduced as production declines and wells are decommissioned. Given the small number of new wells (up to 37) and land disturbed (up to 206 acres) under the 2015 RFD Scenario, this offsetting may not introduce any new or disproportionate adverse environmental impacts over existing conditions within the communities of Coalinga, King City, San Ardo, and San Lucas.

Existing Guidance and Regulations

A number of existing BLM and California permit procedures, environmental analyses requirements, BMPs, and other processes are currently in place or being planned to directly and indirectly reduce the adverse effects of oil and gas development. These requirements would apply to all future environmental analyses, wells, well stimulations, and other enhanced oil recovery techniques occurring under the 2015 RFD Scenario on Federal mineral estate for all alternatives, and would reduce adverse social, economic, and environmental justice effects. These programs and requirements include, but are not limited to:

- BLM Land Use Planning Handbook, Appendix D: currently available for viewing at http://www.blm.gov/style/meDialib/Blm/Ca/Pdf/Pa/Planning.Par.45838.File.dat/landuse_hb.pdf
- The BLM Oil and Gas Management Program: currently available for viewing at http://www.blm.gov/ca/st/en/prog/energy/og/electronic_permittin.html
- BLM Approved Resource Management Plan Amendments/Record of Decision for Designation of Energy Corridors on Bureau of Land Management–Administered Lands in the 11 Western States: currently available for viewing at http://corridoreis.anl.gov/documents/docs/Energy_Corridors_final_signed_ROD_1_14_2009.pdf
- California Department of Oil, Gas & Geothermal Resources (DOGGR) Laws and Regulations: currently available for viewing at http://www.conservation.ca.gov/dog/pubs_stats/Pages/law_regulations.aspx
- DOGGR Well Stimulation Treatment Final Regulations: currently available for viewing at ftp://ftp.consrv.ca.gov/pub/oil/laws/Final%20Text%20of%20SB%204%20WST%20Regulations.pdf

4.17.3 Impacts of Alternative A (No Action)

Under Alternative A, approximately 725,500 acres of Federal mineral estate would be open to oil and gas leasing with CSU or NSO stipulations. This alternative maintains the management direction of the 2007 HFO RMP under which all Federal mineral estate would be available for oil and gas leasing with the exception of 67,500 acres of exclusion areas (i.e., Wilderness Areas, Wilderness Study Areas, Clear Creek Serpentine ACEC, and Fort Ord National Monument).

Alternative A would designate the largest acreage of Federal mineral estate open to leasing, which would provide the BLM with greater flexibility in identifying sites for locating ground disturbance activities. Under Alternative A, more BLM-administered mineral estate is available for locating the 37 future wells under the 2015 RFD Scenario. While utilizing a larger management area may avoid concentrating disturbance impacts in a given area, it is unlikely new wells would be developed outside areas currently producing. Social and economic effects of Alternative A would be negligible in the regional and local study areas relative to existing conditions. Based on the small number of wells developed on BLM-administered mineral estate over the 20-year 2015 RFD Scenario, negligible direct and secondary jobs would be added due to increased oil and gas development under Alternative A.

Under Alternative A, split estate leases are possible under the 2015 RFD Scenario as all areas currently open would remain open to oil and gas leasing. As discussed in Section 4.17.2, split estate leases can have adverse effects to private landowners and local jurisdictions should they preclude existing or planned land uses and result in potential effects to the economic/social goals and direction sought by the local jurisdiction for the area. Under Alternative A, existing BLM management strategies during split estate lease negotiations and processing would occur.

Within both the regional and local study areas of the CCFO Planning Area, there are different groups (such as farmers, recreationists, and energy workers) that could have differing values and objectives concerning the use of public lands for oil and gas extraction. Conflicts between these differing values and objectives are likely to be exacerbated by changes such as population growth, shifting demographics, localized land development and planning, and increasing energy-related activity. However, future environmental analyses, necessary permits, and continued adherence to BLM best management practices (BMPs) and programs linked to energy development are intended to mitigate adverse social effects during the 2015 RFD Scenario.

As discussed in Section 4.17.2, the groups most likely to suffer adverse effects under Alternative A are the local study area communities of King City, San Ardo, and San Lucas, which contain a disproportionately high concentration of minority and low-income populations when compared to the larger region. However, as discussed in Section 4.17.2, the environmental effects from oil and gas extraction already occur within these areas. Any adverse effects from the development of 37 wells on 206 total acres over the next 20-years are not considered to be disproportionately higher in intensity than that occurring in the local study area: the number of existing producing wells within Fresno (11,550 existing wells), Monterey (3,596 existing wells), and San Benito Counties (388 existing wells) as shown in Table 3.17-2. Furthermore, any adverse environmental effects may be offset as production is reduced within existing fields. Because the 2015 RFD Scenario only includes the development of up to 37 wells, the conversion of this land to oil and gas lease areas (assumed not open to public use) is not considered to be borne at a disproportionately higher level by these communities when considering the overall amount of land currently developed with oil and gas facilities and the amount of BLM public lands available to these sensitive communities. As discussed above in Section 4.17.2 under existing mitigation strategies, future site-specific environmental analyses by the BLM would be conducted to determine if any specific groups are affected and represent a disadvantaged community from an environmental justice standpoint for new leases occurring under Alternative A.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A Subalternative 1, the 14 non-NSO leases subject to the settlement agreement would be issued. The nearest incorporated communities to these leases are Coalinga (Fresno County) (Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828, located in San Benito County) and King City (Monterey County) (Leases CACA 052960, 052959, 053824, 053825, 053826 and 053827). It is unknown how many wells may be developed within these leases. However, because these leases are located within the expected areas where the majority of oil and gas development would occur within BLM-administered mineral estate under the 2015 RFD Scenario, social and environmental effects from development of these leases are the same as those described in Section 4.17.2. Alternative A Subalternative 1 would not change the current management goals, objectives, and direction of the lease areas as specified in the 2007 HFO RMP. The existing BLM mitigation strategies discussed above in Section 4.17.2 would apply to any oil and gas developments and activities within these leases.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impact would occur.

4.17.4 Impacts of Alternative B

Alternative B would include up to 32 wells drilled under the 2015 RFD Scenario. However, Alternative B only includes approximately 39,000 acres of Federal mineral estate open to oil and gas leasing with CSU stipulations. Open lease areas are restricted to Federal mineral estate within the boundaries of oil and gas fields plus a 0.5-mile buffer as defined by DOGGR. This alternative would designate the least acreage of Federal mineral estate available for oil and gas leasing among all of the alternatives.

When considering the proposed locations of Federal mineral estate lands open to oil and gas leasing under Alternative B on Figure 2-2, all designated areas are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Sections 4.17.1 and 4.17.2, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to occur under the 2015 RFD Scenario. Therefore, the impacts described in Section 4.17.2 describe those expected under Alternative B. As described in Section 4.17.2, a number of existing BLM and California permit procedures, environmental analyses requirements, BMPs, and other processes are currently in place or being planned to directly and indirectly mitigate the adverse effects of oil and gas development under Alternative B.

As described programmatically in Section 4.17.2, split estate leases have the potential to result in direct and indirect adverse (and beneficial) economic effects on landowners and local governments. By issuing a split estate lease, the development of oil and gas activities within the leased area can preclude existing or planned land uses and result in potential effects to the economic/social goals and direction sought by the local jurisdiction for the area. This issue was raised during the Social and Economic Workshop held on February 4, 2015 (see Appendix F).

Under Alternative B, split estate leases are possible under the 2015 RFD Scenario, but limited to lands open to leasing within a 0.5-mile buffer around existing oil and gas fields as defined by the California DOGGR. Land within existing oil and gas fields are not expected to require split estate leases. Furthermore, lands within a 0.5-mile buffer around existing oil and gas fields would reduce potential impacts from any split estate leases conflicting with local jurisdiction land use planning or economic goals related to other uses of these lands. While the number of wells developed under the 2015 RFD scenario are considered negligible and would be limited to lands within oil and gas fields and 0.5-mile buffer areas currently defined by DOGGR, future split estate leases occurring under the 2015 RFD Scenario under Alternative B may result in minor adverse social and economic impacts to affected local jurisdictions. Mitigation Measure SE-1 in Appendix C is proposed to ensure the enhancement of outreach and coordination efforts with surface owners, vested parties, and local jurisdictions throughout the split estate lease process to reduce adverse social and economic impacts from split estate leases under Alternative B. While these impacts could also occur under Alternative A (No Action), Alternative B allows for an amendment to the RMP and therefore mitigation is proposed.

It should be noted that Alternative B includes more designated open lease area within San Benito and Fresno Counties, resulting in less potential for social and economic effects to occur within Monterey County as compared to Alternative A. Furthermore, Alternative B may provide the greatest benefit to non-market values throughout the CCFO Planning Area compared to all other alternatives by including the most areas closed to oil and gas leasing. However, this determination is contingent on those areas closed for oil and gas leasing not being developed with allowable uses that may diminish important resources such as recreation use and visual quality.

Leases Subject to Settlement Agreement

Under Alternative B, a portion of the area of 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas development (Section 2.7.2) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development (see Table 2-3).

Depending on location, some entire leases would be open for development, others would be all or nearly all closed. Many would have a mixture of open and closed areas. Of the total lease area of approximately 17,600 acres, 22 percent would be open with CSU stipulations and 78 percent would be closed. It is unknown how many wells may be developed within the areas open for leasing. However, because these leases are located within the expected areas where the majority of oil and gas development would occur within BLM-administered mineral estate under the 2015 RFD Scenario, social and environmental effects from development of these leases are described in Section 3.17.2. Existing stipulations and mitigation strategies (as identified earlier) would be used to avoid and minimize impacts.

4.17.5 Impacts of Alternative C

Under Alternative C, approximately 368,800 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 29,800 would be open with NSO. The designated open lease areas would include Federal mineral estate within high oil and gas occurrence potential areas or within the boundaries of oil and gas fields plus a 0.5-mile buffer as defined by DOGGR. The alternative would designate a moderate acreage of Federal mineral estate as available for oil and gas leasing compared with the other alternatives (i.e., less than Alternatives A, E, and F; more than Alternatives B and D). It should be noted that Alternative C distributes designated open lease area similar to Alternative A and F within Monterey, San Benito, and Fresno Counties. However, a significant portion of the proposed acreage is open with restrictions.

When considering the proposed locations of Federal mineral estate open to oil and gas leasing under Alternative C on Figure 2-3, the majority of designated lands are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Sections 4.17.1 and 4.17.2, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to occur under the 2015 RFD Scenario. Therefore, the impacts described in Section 4.17.2 describe those expected under Alternative C.

As described in Section 4.17.2, a number of existing BLM and California permit procedures, environmental analyses requirements, BMPs, and other processes are currently in place or being planned to directly and indirectly mitigate the adverse effects of oil and gas development under Alternative C.

Under Alternative C, split estate leases under the 2015 RFD Scenario could occur within high oil and gas occurrence potential areas open to leasing. Lands with moderate, low and no oil and gas occurrence potential areas would be closed. Compared to Alternative B, the significant increase in land acreage open for leasing directly increases the potential for split estate leases to occur and potentially result in adverse effects. Based on concerns raised during the Social and Economic Workshop held on February 4, 2015, future split estate leases occurring under the 2015 RFD Scenario under Alternative C may result in minor adverse social and economic impacts to affected local jurisdictions (as described programmatically in Section 4.17.2 and similar to that described earlier for Alternative B). Mitigation Measure SE-1 in Appendix C is proposed to further enhance the outreach and coordination efforts with surface owners, vested parties, and local jurisdictions throughout the split estate lease process to reduce adverse social and economic impacts from split estate leases under Alternative C.

Leases Subject to Settlement Agreement

Under Alternative C, the 14 non-NSO leases would be implemented in BLM-managed areas that are open to oil and gas leasing with CSU stipulations. The nearest incorporated communities to these leases are Coalinga (Fresno County) (Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828 located in San Benito County) and King City (Monterey County) (Leases CACA 052960, 052959, 053824, 053825, 053826 and 053827). It is unknown how many wells may be developed within these leases. However, because these leases are located within the expected areas where the majority of oil and gas development would occur within BLM-administered mineral estate under the 2015 RFD Scenario,

social and environmental effects from development of these leases are described in Section 3.17.2. The existing and proposed mitigation strategies discussed above would apply to any oil and gas developments and activities within these leases.

4.17.6 Impacts of Alternative D

Under Alternative D, approximately 121,200 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 16,400 acres would be open with NSO. Open lease areas are restricted to Federal mineral estate underlying BLM surface estate. All BLM split estate lands and the Ciervo-Panoche Natural Area would be closed to leasing.

When considering the proposed locations of Federal mineral estate open to oil and gas leasing under Alternative D on Figure 2-4, the majority of designated areas are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Sections 4.17.1 and 4.17.2, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to occur under the 2015 RFD Scenario. Therefore, the impacts described in Section 4.17.2 describe those expected under Alternative D.

As described in Section 4.17.2, a number of existing BLM and California permit procedures, environmental analyses requirements, BMPs, and other processes are currently in place or being planned to directly and indirectly mitigate the adverse effects of oil and gas development under Alternative D. Based on concerns raised during the Social and Economic Workshop held on February 4, 2015, no minor adverse social and economic impacts would occur on split estate leases to affected local jurisdictions (as described programmatically in Section 4.17.2 and identical to that described earlier for Alternative B). As shown in Table 2-1, all split estate lands would be closed to oil and gas leases under Alternative D. While the inclusion of Mitigation Measure SE-1 under Alternatives B, C, E and F is proposed to reduce potential adverse socioeconomic effects from split estate leases, closing split estate lands under Alternative D is considered to reduce potential impacts in comparison to the other alternatives evaluated.

It should be noted that Alternative D would designate the second smallest acreage of Federal mineral estate available for oil and gas leasing among all the alternatives. Therefore, Alternative D may provide the second greatest benefit to non-market values throughout the CCFO Planning Area compared to all other alternatives by including a significant amount of area closed to oil and gas leasing. However, this determination is contingent on those areas closed for oil and gas leasing not being developed with allowable uses that may diminish recreation use and visual quality.

Leases Subject to Settlement Agreement

Under Alternative D, a portion of the area of the 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas development (Section 2.10.2 and Table 2-3) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development. Two leases would be entirely open; one would be entirely closed. Most leases would have a mixture of open and closed areas. Of the total lease area of approximately 17,600 acres, approximately 25 percent would be open with CSU stipulations and 75 percent would be closed. It is unknown how many wells may be developed within the areas open for leasing. However, because these leases are located within the expected areas where the majority of oil and gas development would occur within BLM-administered mineral estate under the 2015 RFD Scenario, social and environmental effects from development of these leases are described in Section 3.17.2. Existing stipulations and mitigation strategies (as identified earlier) would be used to avoid and minimize impacts.

4.17.7 Impacts of Alternative E

Under Alternative E, approximately 487,200 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 206,400 acres would be open with NSO. The designated open lease

areas would include Federal mineral estate outside of a California DWR Bulletin 118, Groundwater Basin or Sub-basin. The alternative would designate the second largest acreage of Federal mineral estate available for oil and gas leasing among all of the alternatives.

When considering the proposed locations of Federal mineral estate open to oil and gas leasing under Alternative E on Figure 2-5, the majority of designated lands are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Sections 4.17.1 and 4.17.2, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to occur under the 2015 RFD Scenario. Therefore, the impacts described in Section 4.17.2 describe those expected under Alternative E. When compared to all other alternatives, Alternative E would be similar in potential for social and economic effects with the exception of Alternatives B and D, which have the greatest proposed acreage closed to oil and gas leases and may increase non-market value benefits.

As described in Section 4.17.2, a number of existing BLM and California permit procedures, environmental analyses requirements, BMPs, and other processes are currently in place or being planned to directly and indirectly mitigate the adverse effects of oil and gas development under Alternative E.

Under Alternative E, split estate leases under the 2015 RFD Scenario could occur within Federal mineral estate lands outside of California Department of Water Resources (DWR) Bulletin 118 groundwater basins & sub-basins open to leasing. Compared to Alternative B, the significant increase in land acreage open for leasing directly increases the potential for split estate leases to occur and potentially result in adverse effects. Compared to Alternative C, the potential for split estate leases to result in adverse effects would be greater for Alternative E as they could occur in areas not designated with high oil and gas occurrence potential (acknowledging that new wells would likely not be developed outside these areas). Based on concerns raised during the Social and Economic Workshop held on February 4, 2015, future split estate leases occurring under the 2015 RFD Scenario under Alternative E may result in minor adverse social and economic impacts to affected local jurisdictions (as described programmatically in Section 4.17.2 and similar to that described earlier for Alternative B). Mitigation Measure SE-1 in Appendix C is proposed to further enhance the outreach and coordination efforts with surface owners, vested parties, and local jurisdictions throughout the split estate lease process to reduce adverse social and economic impacts from split estate leases under Alternative E.

Leases Subject to Settlement Agreement

Under Alternative E, a portion of the 14 non-NSO leases would be open to leasing. Of the total lease area of approximately 17,600 acres, approximately 57 percent would be open with CSU stipulations, 41 percent would be open with NSO, and 2 percent would be closed. Alternative E would incorporate new restrictions in the current management goals, objectives, and direction of the lease areas from what was specified in the 2007 HFO RMP. The existing and proposed mitigation strategies discussed above would also apply to any oil and gas developments and activities within these leases. The nearest incorporated communities to these leases are Coalinga (Fresno County) (Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828, located in San Benito County) and King City (Monterey County) (Leases CACA 052960, 052959, 053824, 053825, 053826 and 053827). It is unknown how many wells may be developed within these leases. However, because these leases are located within the expected areas where the majority of oil and gas development would occur within BLM-administered mineral estate under the 2015 RFD Scenario, social and environmental effects from development of these leases are described in Section 3.17.2. Existing stipulations and mitigation strategies (as identified earlier) would be used to avoid and minimize impacts.

4.17.8 Impacts of Alternative F

Under Alternative F, 683,100 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 42,400 acres would be open with NSO. When considering the proposed locations of

Federal mineral estate open to oil and gas leasing under Alternative F (shown on Figure 2-6), the majority of designated areas are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Sections 4.17.1 and 4.17.2, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to occur under the 2015 RFD Scenario. Therefore, the social and economic impacts described in Section 4.17.2 would be the same as those expected under Alternative F.

As described in Section 4.17.2, a number of existing BLM and California permit procedures, environmental analyses requirements, BMPs, and other processes are currently in place or being planned to directly and indirectly mitigate the adverse effects of oil and gas development under Alternative F. Based on concerns raised during the Social and Economic Workshop held on February 4, 2015, no minor adverse social and economic impacts would occur on split estate leases to affected local jurisdictions (as described programmatically in Section 4.17.2).

Under Alternative F, split estate leases are possible under the 2015 RFD Scenario, but limited to lands open to leasing within a 0.5-mile buffer around existing oil and gas fields as defined by the California DOGGR. Land within existing oil and gas fields are not expected to require split estate leases. Furthermore, lands within a 0.5-mile buffer around existing oil and gas fields would reduce potential impacts from any split estate leases conflicting with local jurisdiction land use planning or economic goals related to other uses of these lands. While the number of wells developed under the 2015 RFD scenario are considered negligible and would be limited to lands within oil and gas fields and 0.5-mile buffer areas currently defined by DOGGR, future split estate leases occurring under the 2015 RFD Scenario under Alternative F may result in minor adverse social and economic impacts to affected local jurisdictions. Mitigation Measure SE-1 in Appendix C is proposed to ensure the enhancement of outreach and coordination efforts with surface owners, vested parties, and local jurisdictions throughout the split estate lease process to reduce adverse social and economic impacts from split estate leases under Alternative F. When compared to Alternatives A through E, the social and economic impacts associated with Alternative F would be similar or identical programmatically.

It should be noted that Alternative F, along with Alternative A, would designate the highest acreage of Federal mineral estate available for oil and gas leasing among all of the alternatives. However, future environmental analyses, necessary permits, and continued adherence to BLM best management practices (BMPs) and programs linked to energy development are intended to mitigate adverse social effects during the 2015 RFD Scenario. As discussed in Section 4.17.2, the groups most likely to suffer adverse effects under Alternative F are the local study area communities of King City, San Ardo, and San Lucas, which contain a disproportionately high concentration of minority and low-income populations when compared to the larger region. However, as discussed in Section 4.17.2, the environmental effects from oil and gas extraction already occur within these areas.

Leases Subject to Settlement Agreement

Under Alternative F, the 14 non-NSO leases would be implemented in BLM-managed areas that are open to oil and gas leasing with CSU stipulations. The nearest incorporated communities to these leases are Coalinga (Fresno County) (Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828 located in San Benito County) and King City (Monterey County) (Leases CACA 052960, 052959, 053824, 053825, 053826 and 053827). It is unknown how many wells may be developed within these leases. However, because these leases are located within the expected areas where the majority of oil and gas development would occur within BLM-administered mineral estate under the 2015 RFD Scenario, social and environmental effects from development of these leases are described in Section 3.17.2. The existing and proposed mitigation strategies discussed above would apply to any oil and gas developments and activities within these leases.

4.18 Transportation and Access

This section focuses on BLM roads and trails that provide access to, and through, BLM public lands. There is considerable overlap of travel management and all BLM uses on public lands. For example, many users of public lands are there for recreation. For visitors, a route system may serve as either a route to a destination or as the recreation location itself. For destination recreation, vehicle routes are the means to get to a starting point to engage in the activity, such as a parking area or trailhead. The route itself also can serve as the focus of the activity (e.g., pleasure driving, four-wheel vehicle driving, motorcycling, all-terrain vehicle (ATV) riding, biking, horseback riding, hiking, snowmobiling, and cross-country skiing. To reduce the duplication of narrative between travel management and the other sections of this RMPA/EIS, this section addresses only public travel and access concerns in relation to the development of the 2015 Reasonably Foreseeable Development (RFD) Scenario for oil and gas development on Federal mineral estate within the Central Coast Field Office (CCFO) Planning Area (Planning Area).

4.18.1 Introduction

Approach to Impact Assessment

This impact analysis evaluates the proposed RMPA alternatives for potential conflicts with BLM travel management goals or objectives. As discussed in Section 3.18, BLM's Comprehensive Travel and Transportation Management (CTTM) program and Executive Orders 11644 and 11989 establish core guidelines and management strategies that BLM utilizes for travel management. A discussion of the regional transportation network, including highways, major roads, County roads, rail, and aviation is not included. The discussion of hazardous materials transport is in Sections 3.4 and 4.4 (Hazardous Materials and Public Safety).

The management goals for Transportation and Access from the 2007 HFO RMP are restated here:

- The goals for transportation and access are to (1) maintain roads for administrative purposes; (2) support local counties and the State of California in providing a network of roads for movement of people, goods, and services across public lands; and (3) manage motorized access use to protect resource values, promote public safety, provide responsible motorized access use opportunities where appropriate, and minimize conflicts among various user groups.

The Area-wide Transportation and Access Management Actions from the 2007 HFO RMP include:

- **TRANS-COM1.** Public vehicle use on all BLM lands would be limited to designated routes, except as noted. As outlined in the Interim Management Policy (IMP) for Lands Under Wilderness Review and wilderness legislation, WSAs and Wilderness Areas would be closed to vehicle use, except on designated pre-existing vehicle ways.
- **TRANS-COM2.** Complete route maintenance and improvement work in accordance with implementation standards and references from the following sources:
  - BLM Manuals 9113, H-9113-2, and 9114
  - Federal Highway Administration (FHWA) Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects Standards
  - U.S. Forest Service Trails Handbook 2309.18 (Section 2.32 (a)(b)(c))
- **TRANS-C1.** Reclaim redundant road systems or roads that no longer serve their intended purpose to protect sensitive resources, reduce sediment transport, and control erosion.
- **TRANS-C2.** Implement BMPs to reduce off-site water quality impacts from roads and trails that no longer serve their original purpose or exceed State soil loss standards.

- **TRANS-C3.** Temporarily close roads to vehicle use during periods of extreme wet weather in areas where sustained vehicle use may compromise the integrity of the road surface.
- **TRANS-C4.** Mitigate or relocate travel routes that traverse riparian areas or cross critical habitat, and occupied or potential habitat, of special status species.

BLM Best Management Practices (BMPs) and Standard Operating Procedures (SOPs) are listed in Appendix D of this EIS. They are BLM methods, measures, or practices selected on the basis of site-specific conditions to provide the most effective, environmentally sound, and economically feasible means of managing an activity and mitigating its impacts. Several BMPs and SOPs listed in Appendix D, Section 1.6 (Oil and Gas Standard Operating Procedures, Implementation Guidelines and Conditions of Approval) would apply to reducing potential impacts to BLM transportation facilities and land accessibility from oil and gas leases.

BLM is unable to quantify impacts on transportation from the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.18. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects on transportation from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground. Other incomplete or unavailable information includes the type(s) of development(s) and site-specific resource conditions because it's impossible for BLM to know how, where, or when leases would be developed. BLM is unable to quantify effects on roads and associated infrastructure under the range of alternatives. As a result, the evaluation of such impacts considers current resource conditions described in Section 3.18, and the regulatory framework described in Appendix J.

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of federal minerals in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99 percent) of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects on transportation systems in the region and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

Assumptions

The following assumptions were used to complete the analysis for transportation and access impacts from the proposed Resource Management Plan Amendment (RMPA):

- Future environmental analyses would be conducted, as appropriate, for project- and site-specific actions proposed in the CCFO administrative boundary. Applications for Permit to Drill would address potential loss of access or disruption to existing transportation routes from oil and gas development on BLM affected transportation facilities.
- As described in Section 2.5.2, the same level of oil and gas development under the 2015 RFD Scenario would apply to Alternatives A, C, D, and E (i.e., 37 exploratory and development wells on 206 acres of disturbance). Alternative B would have 32 development wells and up to 179 acres of disturbance.

- All surface-disturbing activities related to the 2015 RFD Scenario would most likely occur on BLM-administered mineral estate in Fresno, Monterey, and San Benito Counties within the area of high oil and gas occurrence potential (shown in Figure 5-1) for the CCFO but may potentially occur anywhere that is open to oil and gas leasing.
- New oil and gas well locations developed under the 2015 RFD Scenario would most likely be within or near established producing oil and gas fields but may potentially occur anywhere that is open to oil and gas leasing.

4.18.2 Impacts Common to All Alternatives

Development of New Roads

Under the 2015 RFD Scenario, up to 37 exploratory and development wells would be developed on a maximum of 206 acres of disturbance. This disturbance area includes any new access roads needed to access the new well sites. This amount of oil and gas development would require only short (approximately 0.25 to 0.5 miles long) segments of new roads, which would likely be closed to the public and for oil and gas worker use only. New access roads would most likely be located within, or adjacent to, existing oil and gas fields.

In general, the heavy equipment and materials needed for well development and stimulations do not pose unique transportation challenges. New access roads or improvements may be necessary if new well sites are not served by existing roadways, or access routes are not built to support heavy truck traffic up to the Federal limit of 80,000 pounds gross vehicle weight for the National Network (Title 23 Code of Federal Regulations [CFR] Part 658). In addition, a small number of one-time oversized and overweight shipments may be required for larger earthmoving equipment used in site preparation.

The construction of new roads is not considered to have secondary maintenance and system management impacts, as the well developer would likely maintain these roads to ensure site access. Changes in the level and types of traffic could result in secondary impacts on the governmental entities that manage the road system if added sign maintenance or patrol becomes warranted in order to institute these restrictions.

Alter the Availability or Accessibility of BLM Routes of Travel

Under all alternatives, the BLM's management of travel routes and access would remain identical to that under the existing 2007 HFO RMP. Some level of use restriction to existing open travel routes and access points on BLM lands may be necessary to varying degrees under the various alternatives with the 2015 RFD Scenario. This may include temporary or permanent closure of roads due to the presence of new wells, or due to a new private access roadway restricting public traffic flow or access requiring a change in travel route designations (i.e., open, limited, or closed). Site closure is typically necessary for well development, which limits travel to and from off-site locations. Depending on the location, this disruption may create minor or negligible adverse effects, as some users may prefer to use existing BLM open routes year-round. Furthermore, the development of wells and facilities under the 2015 RFD Scenario may alter the amount and distribution of oil and gas-related traffic on existing roads.

User conflicts could potentially occur in areas where there is public non-motorized and motorized use within the same travel ways as oil and gas related traffic and uses. It is anticipated that motorized recreational vehicle traffic on roads and trails remaining open would increase incrementally over time, and may increase as a result of road closures redirecting traffic to open roadways.

It is possible that portions of new lease areas could be fenced or marked to prohibit public use. This could occur in areas currently used by the public for access to recreational opportunities or for travel on BLM-administered lands. While related to transportation and access, this type of potential impact is also considered a land use conflict, which is specifically discussed in Sections 4.14 (Special Management Areas)

and 4.19 (Lands and Realty). Because most access in the CCFO Planning Area is dependent on motor vehicles, the location of travel routes and the potential loss of access to recreation assets must be considered with new oil and gas leasing activity. As identified in the assumptions presented in Section 4.18.1, this would occur during future environmental analyses for all lease applications and permits to drill. While other land uses are allowed within the areas proposed for open oil and gas leasing, these uses must be compatible with the resources and values that the land designation is intended to protect. Depending on the alternative, management actions may apply to protect lease areas for Recreation and Public Purposes (ENERG-COM3 in Alternatives A and D) or to minimize or eliminate conflict between oil and gas development and existing surface uses (CSU stipulations in each alternative except Alternative A). The analysis of land use issues is provided in Sections 4.14 (Special Management Areas) and 4.19 (Lands and Realty).

Traffic Generation

Activities under the 2015 RFD Scenario may increase traffic on nearby roads. The majority of trips generated would be temporary, occurring primarily during well development and any stimulation treatments. Once operational, each well would generate a negligible amount of daily vehicle trips. The primary impact of concern would be any performance degradation of roadways providing key access to the well sites. Because the location of future wells is unknown, a quantitative trip analysis is not feasible as the utilized roadways are unknown. However, the distance of well sites from major roads will to some extent determine the potential for traffic to change local circulation patterns or degrade local roads and cause congestion problems, especially from heavy-duty trucks. In general, commuting workers and equipment and materials deliveries to each well during development would cause a small increase in the existing volume of traffic on roadways and highways providing local and regional access. For a well stimulation treatment, the maximum trips generated per well stimulation project would be approximately 51 trips per day (DOC, 2015).

An important aspect when considering traffic volume increases over existing conditions is the life cycle of existing oil and gas extraction. As the availability of oil and gas resources decline, production decreases. Existing traffic volumes from current field activities, including well stimulations, also would decrease as compared to periods of higher oil and gas production. As most of the recoverable resource is removed, well stimulation is no longer effective in increasing flow to a level that would justify its continued use. Therefore, as new activities (and any new traffic volumes) that occur under the 2015 RFD Scenario are introduced, existing activities (and any existing traffic volumes) would be reduced as production declines and wells are decommissioned. Therefore, over the life of the 2015 RFD Scenario (15-20 years), no net traffic increases may occur from the development of up to 37 new wells.

Existing Mitigation Strategies

Existing BLM strategies in place as part of the existing RMP guide management of transportation and access facilities. These management actions would indirectly mitigate the adverse effects of oil and gas development and their effects on BLM transportation facilities. These requirements would apply to all future environmental analyses, wells, well stimulations, and other enhanced oil recovery techniques occurring under the 2015 RFD Scenario on BLM-administered mineral estate for all alternatives. As stated within the existing RMP, the primary management strategy is that public vehicle use on all BLM lands would be "limited" to designated routes, except as noted. BLM lands closed to vehicle use, except on designated pre-existing vehicle ways, are also discussed in Sections 4.14 (Special Management Areas) and 4.19 (Lands and Realty).

Existing BLM standards regarding road design, construction, and maintenance are described in BLM Manual 9113. An access road siting and management plan should be prepared incorporating these standards, as appropriate. Generally, roads should be required to follow natural contours; be constructed in accordance with standards described in BLM Manual 9113; and be reclaimed to BLM standards. As

described in BLM Manual 9113, BLM roads should be designed to appropriate standards no higher than necessary to accommodate their intended functions.

4.18.3 Impacts of Alternative A (No Action)

This alternative maintains the management direction of the 2007 HFO RMP. As described in Section 4.18.1, the same level of oil and gas development under the 2015 RFD Scenario would apply to the No Action Alternative (i.e., 37 wells and 206 acres of disturbance). Therefore, the level of traffic volumes from 2015 RFD Scenario activities would be the same for all alternatives, with common impacts described in Section 4.18.2.

Alternative A would designate the largest acreage of Federal mineral estate open to oil and gas leasing, which would provide the BLM with greater flexibility in identifying sites for locating ground disturbance activities. Utilizing a larger area available for the 206 acres of surface disturbance under the 2015 RFD Scenario may avoid the need for new access roads and potential conflicts regarding public transportation routes and access to BLM resources. Disruption to existing BLM transportation routes and access impacts associated with oil and gas development may be less severe under Alternative A when compared to the other alternatives. In addition, Mitigation Measure TR-1 (Travel Routes and Access to Open Lands) in Appendix C could be implemented to reduce potential disruption of existing BLM transportation routes or access points as a result of oil and gas development. See Sections 4.14 (Special Management Areas) and 4.19 (Lands and Realty) for a discussion of land use issues.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A Subalternative 1, the 14 non-NSO leases subject to the settlement agreement would be issued. The nearest incorporated communities to these leases are Coalinga (Fresno County) (Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828, located in San Benito County) and King City (Monterey County) (Leases CACA 052960, 052959, 053824, 053825, 053826 and 053827). The Williams Hill Recreation Area, which contains open roads, is located in the in the Monterey County non-NSO lease area (Lease CACA 053825). It is unknown how many wells may be developed within these leases. As discussed in Section 3.18.4, the eight non-NSO leases in San Benito County are within 7 miles of the active Vallecitos oil and gas field boundary, as shown in Figure 2-1 (detailed view), and the six non-NSO leases in Monterey County are located within 10 miles of the active San Ardo oil and gas field. Because these leases are located proximate to areas with existing oil and gas development, relatively minor lengths of new access roads would be needed, as described in the 2015 RFD Scenario. Vehicle trip volumes from these leases are expected to be minor and would occur under the 2015 RFD Scenario, as described in Section 4.18.2.

Alternative A, Subalternative 1 would not change the current transportation management goals, objectives, and direction of the lease areas as specified in the 2007 HFO RMP. The types of potential impacts for these lease areas would be similar to those discussed for the larger Planning Area. The existing BLM mitigation strategies discussed above in Section 4.18.2 and surface transportation management within the existing RMP would apply to oil and gas activities within these leases. In addition to these management strategies, Mitigation Measure TR-1 in Appendix C could be implemented to reduce the potential disruption of existing BLM transportation routes or access points as a result of oil and gas development. As described in Section 4.19 (Lands and Realty), the implementation of these leases under Alternative A, Subalternative 1 would not create a land use conflict. Therefore, all facilities (including new access roads) associated with these leases are not expected to adversely affect current BLM transportation routes or access management.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impact would occur.

4.18.4 Impacts of Alternative B

Relative to Alternative A, Alternative B would also have oil and gas development occurring under the 2015 RFD Scenario but only up to 32 wells. Alternative B includes approximately 39,000 acres of Federal mineral estate open to oil and gas leasing with CSU stipulations. Open lease areas are restricted to Federal mineral estate within the boundaries of oil and gas fields plus a 0.5-mile buffer as defined by DOGGR. This alternative would designate the least acreage of Federal mineral estate available for oil and gas leasing among all of the alternatives.

When considering the proposed locations of Federal mineral estate open to oil and gas leasing under Alternative B on Figure 2-2, all designated areas are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Section 4.18.1, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to occur under the 2015 RFD Scenario. Therefore, the common impacts described in Section 4.18.2 describe those expected under Alternative B. It is likely that new leases and wells under Alternative B could utilize existing transportation routes already providing access to existing oil and gas extraction areas. However, the construction of any new access roads is included within the total disturbance area of 179 acres under the 2015 RFD Scenario.

As discussed in Section 4.18.2, the minor to negligible adverse effects of development of wells and other facilities under the 2015 RFD Scenario include potentially decreasing use of transportation routes and accessibility to surrounding lands. Depending on the location of a lease and well facility, existing BLM travel routes and access points may be altered. While well facilities may be configured to allow some public access through the lease area, it's possible new leases under the 2015 RFD Scenario result in minor adverse effects by establishing new restrictions on existing transportation routes and access points.

As described in Section 4.18.2, existing BLM management strategies are currently in place under the 2007 HFO RMP for transportation routes and access. In addition to these management strategies, Mitigation Measure TR-1 in Appendix C could be implemented to reduce the disruption of existing BLM transportation routes or access points as a result of oil and gas development under Alternative B. With the implementation of this measure, impacts on local transportation networks from the 2015 RFD Scenario under Alternative B would be negligible. Furthermore, any adverse effect may be offset somewhat should new access roads be available to the public as part of new oil and gas leases. New or improved access roads may provide valuable new backbone routes through BLM affected portions of the CCFO Planning Area.

Leases Subject to Settlement Agreement

Under Alternative B, a portion of the area of 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas development (Section 2.7.2 and Table 2-3) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development. Depending on location, some entire leases would be open for development, others would be all or nearly all closed. Many would have a mixture of open and closed areas. Of the total lease area of approximately 17,600 acres, 22 percent would be open with CSU stipulations and 78 percent would be closed. The types of potential impacts for the open lease areas would be similar to those discussed for the larger Planning Area. The existing BLM mitigation strategies discussed above in Section 4.18.2 and Mitigation Measure TR-1 in Appendix C could be implemented to reduce the disruption of existing BLM transportation routes or access points as a result of oil and gas development.

4.18.5 Impacts of Alternative C

Under Alternative C, approximately 368,800 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 29,800 acres would be open with NSO. The designated open lease areas would include Federal mineral estate within high oil and gas occurrence potential areas or within the

boundaries of oil and gas fields plus a 0.5-mile buffer as defined by DOGGR. The alternative would designate a moderate acreage of Federal mineral estate as available for oil and gas leasing compared with the other alternatives (i.e., less than Alternatives A, E, and F; more than Alternatives B and D). It should be noted that Alternative C distributes designated open lease area similar to Alternative A within Monterey, San Benito, and Fresno Counties.

When considering the proposed locations of Federal mineral estate open to oil and gas leasing under Alternative C on Figure 2-3, the majority of designated lands are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Section 4.18.1, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to occur under the 2015 RFD Scenario. Therefore, the common impacts described in Section 4.18.2 describe those expected under Alternative B. When compared to Alternative A and B, the transportation and access impacts associated with Alternative C would be similar or identical programmatically.

Mitigation Measure TR-1 in Appendix C could be implemented to reduce the disruption of existing BLM transportation routes or access points within the CCFO Planning Area from oil and gas development under Alternative C. With the implementation of this measure, impacts on local transportation networks from the 2015 RFD Scenario under Alternative C would be negligible.

Leases Subject to Settlement Agreement

Under Alternative C, the 14 non-NSO leases would be implemented in BLM-managed areas that are open to oil and gas leasing with CSU stipulations. The nearest incorporated communities to these leases are Coalinga (Fresno County) (Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828, located in San Benito County) and King City (Monterey County) (Leases CACA 052960, 052959, 053824, 053825, 053826 and 053827). The Williams Hill Recreation Area, which contains open roads, is located in the in the Monterey County non-NSO lease area (Lease CACA 053825). It is unknown how many wells may be developed within these leases. However, because these leases are located within the expected areas where the majority of oil and gas development would occur within BLM-administered mineral estate under the 2015 RFD Scenario, impacts to transportation and access from development of these leases are the same as those described in Section 4.18.2. The existing BLM transportation management actions and Mitigation Measure TR-1 in Appendix C could be implemented for oil and gas developments and activities within these leases under Alternative C if adopted by BLM.

4.18.6 Impacts of Alternative D

Under Alternative D, approximately 121,200 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 16,400 acres would be open with NSO. Open lease areas are restricted to Federal mineral estate underlying BLM surface estate. All BLM split estate lands and the Ciervo-Panoche Natural Area would be closed to leasing.

When considering the proposed locations of Federal mineral estate open to oil and gas leasing under Alternative D on Figure 2-4, the majority of designated areas are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Section 4.18.1, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to occur under the 2015 RFD Scenario. Therefore, the common impacts described in Section 4.18.2 describe those expected under Alternative B. When compared to Alternatives A through C and E and F, the transportation and access impacts associated with Alternative D would be similar or identical programmatically.

Mitigation Measure TR-1 in Appendix C could be implemented to reduce the disruption of existing BLM transportation routes or access points within the CCFO Planning Area from oil and gas development under Alternative D. With the implementation of this measure, impacts on local transportation networks from the 2015 RFD Scenario under Alternative D would be negligible.

Leases Subject to Settlement Agreement

Under Alternative D, a portion of the area of 14 non-NSO leases, as identified in Hollister I and Hollister II, would be available for oil and gas development (Section 2.10.2 and Table 2-3) and subject to resulting potential impacts as discussed above for the Planning Area. The remaining areas of the leases would be closed to oil and gas development. Depending on location, some entire leases would be open for development, others would be all or nearly all closed. Many would have a mixture of open and closed areas. Of the total lease area of approximately 17,600 acres, approximately 25 percent would be open with CSU stipulations and 75 percent would be closed. The existing BLM mitigation strategies discussed above in Section 4.18.2 and Mitigation Measure TR-1 in Appendix C could be implemented to reduce the disruption of existing BLM transportation routes or access points as a result of oil and gas development.

4.18.7 Impacts of Alternative E

Under Alternative E, approximately 487,200 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 206,400 acres would be open with NSO. The designated open lease areas would include Federal mineral estate outside of a California DWR Bulletin 118, Groundwater Basin or Sub-basin. The alternative would designate the second largest acreage of Federal mineral estate available for oil and gas leasing among all of the alternatives.

When considering the proposed locations of Federal mineral estate open to oil and gas leasing under Alternative E on Figure 2-5, the majority of designated lands are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Section 4.18.1, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to occur under the 2015 RFD Scenario. Therefore, the common impacts described in Section 4.18.2 describe those expected under Alternative B. When compared to Alternatives A through D and F, the transportation and access impacts associated with Alternative E would be similar or identical programmatically.

Mitigation Measure TR-1 in Appendix C could be implemented to reduce disruption of existing BLM transportation routes or access points within the CCFO Planning Area from oil and gas development under Alternative E. With the implementation of this measure, impacts on local transportation networks from the 2015 RFD Scenario under Alternative E would be negligible.

Leases Subject to Settlement Agreement

Under Alternative E, a portion of the 14 non-NSO leases would be open to leasing. Of the total lease area of approximately 17,600 acres, approximately 57 percent would be open with CSU stipulations, 41 percent would be open with NSO, and 2 percent would be closed (see Tables 2-2 and 2-3). Alternative E would incorporate new restrictions in the current management goals, objectives, and direction of the lease areas from what was specified in the 2007 HFO RMP. The existing BLM transportation management actions and Mitigation Measure TR-1 in Appendix C could be implemented for oil and gas developments and activities within these leases under Alternative E if adopted by BLM.

4.18.8 Impacts of Alternative F

Under Alternative F, 683,100 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 42,400 acres would be open with NSO. Open lease areas are restricted to Federal mineral estate underlying BLM surface estate. BLM split estate lands would be open to leasing. When considering the proposed locations of Federal mineral estate open to oil and gas leasing under Alternative F (shown on Figure 2-6), the majority of designated areas are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Section 4.18.1, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to occur under the 2015 RFD Scenario. Therefore, the common impacts described in Section 4.18.2 describe those

expected under Alternative F. When compared to Alternatives A through E, the transportation and access impacts associated with Alternative F would be similar or identical programmatically.

Mitigation Measure TR-1 in Appendix C could be implemented to reduce the disruption of existing BLM transportation routes or access points within the CCFO Planning Area from oil and gas development under Alternative F. With the implementation of this measure, impacts on local transportation networks from the 2015 RFD Scenario under Alternative F would be negligible.

Leases Subject to Settlement Agreement

Under Alternative F, the 14 non-NSO leases would be implemented in BLM-managed areas that are open to oil and gas leasing with CSU stipulations. The nearest incorporated communities to these leases are Coalinga (Fresno County) (Leases CACA 053835, 053834, 053833, 053832, 053831, 053830, 053829, and 053828, located in San Benito County) and King City (Monterey County) (Leases CACA 052960, 052959, 053824, 053825, 053826 and 053827). The Williams Hill Recreation Area, which contains open roads, is in the Monterey County non-NSO lease area (Lease CACA 053825). It is unknown how many wells may be developed within these leases. However, because these leases are located within the expected areas where most oil and gas development would occur within BLM-administered mineral estate under the 2015 RFD Scenario, impacts to transportation and access from development of these leases are the same as those described in Section 4.18.2. The existing BLM transportation management actions and Mitigation Measure TR-1 in Appendix C could be implemented for oil and gas developments and activities within these leases under Alternative F if adopted by BLM.

4.19 Lands and Realty

The BLM's resource management program for Lands and Realty (i.e., Lands and Realty program) includes land tenure adjustments (e.g., disposals and acquisitions), land use authorizations (i.e., leases, permits, right-of-way grants), and withdrawals in order to facilitate management of public lands and resources in the planning area. As discussed in Section 3.19 (Lands and Realty), this RMPA/EIS analyzes the effects of land use authorizations pertaining to oil and gas leasing that would apply to each of the RMPA alternatives (i.e., areas designated open or closed to leasing and applicable stipulations).

4.19.1 Introduction

Approach to Impact Assessment

The goal for lands and realty management presented in the 2007 HFO RMP is to provide lands, interests in land, and authorizations for public and private uses while maintaining and improving resource values and public land administration. Management of land tenure adjustments and withdrawals would not be affected by the RMPA alternatives, and would remain consistent with the management actions established in the 2007 HFO RMP.

For this analysis, the area considered for land use authorizations consists of the BLM-administered surface land and split estate land where BLM manages the Federal mineral estate within the CCFO administrative boundary. The following types of Lands and Realty impacts may occur:

- Direct impacts are those that either reduce or enlarge the area upon which land use authorizations can occur (e.g., identification of exclusion areas reduces the locations in which use authorizations may be issued). As such, the number of acres where lands and realty actions are potentially restricted is used to indicate the impact of management actions and decisions.
- Indirect impacts would potentially occur from restrictions that limit the type of development allowed by a specific use authorization (e.g., requirements to comply with BMPs and SOPs). BMPs could be applied as Conditions of Approval (COA) at the time of permitting of oil and gas drilling or related operations or other activities.

BLM is unable to quantify impacts on lands and realty from the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.19. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects on lands and realty from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground. Other incomplete or unavailable information includes the type(s) of development(s) and site-specific resource conditions because it's impossible for BLM to know how, where, or when leases would be developed. BLM is unable to quantify effects on valid existing rights and other FLPMA authorizations from the range of alternatives. As a result, the evaluation of such impacts considers current resource conditions described in Section 3.19, and the regulatory framework described in Appendix J.

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of federal minerals in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99 percent) of future oil and gas activity in the planning area would occur inside active fields in

Fresno, San Benito, or Monterey Counties. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects on lands and realty in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

Assumptions

The analysis is based on the following assumptions:

- The following areas identified in the 2007 HFO RMP would not change: land tenure adjustments (i.e., retention and disposal areas), areas identified for withdrawal, and avoidance and exclusion areas for non-oil and gas projects.
- Oil and gas lease stipulations and COAs that limit land use authorizations (e.g., ROWs, leases, and permits) to support oil and gas development would not preclude the BLM from granting land use authorizations for other purposes (not related to oil and gas).
- Future environmental analyses would be conducted, as appropriate, for project- and site-specific actions proposed in the CCFO Planning Area. Applications for Permit to Drill would address potential conflicts between oil and gas development and other resources within the site specific area.
- As described in Section 2.5.2, the same level of oil and gas development under the 2015 RFD Scenario would apply to Alternatives A and C through F (i.e., 37 exploratory and development wells on 206 acres of disturbance). Alternative B assumes that all development would be within existing oil and gas fields only (up to 32 development wells on 179 acres of disturbance), so no additional exploratory wildcat wells would be developed.
- All surface-disturbing activities related to the 2015 RFD Scenario would most likely occur on BLM-administered mineral estate in Fresno, Monterey, and San Benito Counties within the area of high oil and gas potential (shown in Figure 5-1) for the CCFO Planning Area but may potentially occur anywhere that is open to oil and gas leasing. New oil and gas well locations would most likely be within or near established producing oil and gas fields.

4.19.2 Impacts Common to All Alternatives

This section describes typical impacts to BLM lands and realty specifically associated with various oil and gas facilities and infrastructure that would be permitted under the Proposed RMPA alternatives. For each alternative, the development of oil and gas facilities would establish a long-term industrial use at future lease sites, which may prevent the authorization of non-energy land uses in the area (e.g., recreation, agriculture).

Impacts from Oil and Gas Development

As discussed in the 2015 RFD Scenario, it is unlikely that more than 37 exploratory and development wells would be drilled on Federal oil and gas leases. The development of new wells within the CCFO Planning Area would create long-term impacts during well construction, operation, and decommissioning. Construction and decommissioning activities could disrupt existing land uses, prevent access to some locations, or conflict with BLM policies or regulations pertaining to non-energy land uses, leading to impacts that could range from minor to major. Operation and maintenance activities on BLM-administered mineral estate would require long-term land use that could convert BLM lands to permanent industrial use. Other long-term impacts may include closing public areas and removing BLM lands from non-energy land uses such as recreation. Long-term changes to established land uses would create a permanent, major impact. Many of these conflicts with existing land uses and surface land owners were identified as issues of concern during the BLM's Social and Economic Workshop held on February 4, 2015 (see Appendix F).

Impacts from Management Actions

Sections 4.19.3 through 4.19.7 describe the range in total acreage open for leasing under each alternative, while a minimum of 67,500 acres would be closed to leasing under all alternatives. Areas closed to leasing limit the potential for oil and gas developments to preclude other land use authorizations not related to oil and gas in those areas. Current management decisions under the 2007 HFO RMP would continue to determine non-oil and gas land use authorizations within the CCFO Decision Area.

Best Management Practices

The BLM has developed requirements for conducting environmentally responsible oil and gas operations on BLM-administered surface land and split estate land. Appendix D (Best Management Practices) includes a compilation of existing BLM policies, guidelines, and practices designed to prevent unnecessary or undue degradation of public land resources. The BLM has also identified specific oil and gas development requirements to minimize environmental impacts, which are separately published in the Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (commonly referred to as The Gold Book). For each Application for Permit to Drill (APD), the BLM would select and apply BMPs based on site-specific conditions to meet a variety of resource objectives for specific management actions.

4.19.3 Impacts of Alternative A (No Action)

Impacts from Oil and Gas Development

Under Alternative A, approximately 683,800 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 41,700 acres would be open to oil and gas leasing with No Surface Occupancy (NSO). This alternative maintains the management direction of the 2007 HFO RMP under which all Federal mineral estate would be available for oil and gas leasing with the exception of specific exclusion areas (i.e., Wilderness Areas, Wilderness Study Areas, Clear Creek Serpentine Area of Critical Environmental Concern, and Fort Ord National Monument).

Alternative A (tied with Alternative F) would designate the largest acreage of Federal mineral estate open to leasing, which would provide the BLM with greater flexibility in identifying sites for locating ground disturbance activities than the other RMPA alternatives. However, under each of the alternatives new oil and gas well locations would most likely be within or near established producing oil and gas fields. Surface disturbance impacts associated with oil and gas development would be long-term, but would be moderate under Alternative A given the expected proximity of new oil and gas development to existing production areas.

Impacts from Management Actions

Under Alternative A, approximately 41,700 acres would be subject to NSO stipulations with implementation of the following management actions, which are identified in Section 2.6:

- **ENERG-COM3.** Require No Surface Occupancy stipulations on all Recreation and Public Purposes (R&PP) lease areas.
- **ENERG-C1.** Oil and gas leases in Areas of Critical Environmental Concern (ACECs) would stipulate No Surface Occupancy in special status species habitat (BLM, 2007; Appendix D)

Areas subject to the above management actions could restrict the placement or routing of oil and gas infrastructure (i.e., roads or pipelines), which may limit access or delay energy projects. However, the above management actions would effectively avoid conflicts between oil and gas development and existing BLM land management and land use authorizations in ACECs and R&PP leases. Endangered species stipulations would apply to all areas open to oil and gas leasing. With application of these management actions and resulting stipulations, impacts to land use authorizations would be negligible.

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative A.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A, the 14 non-NSO leases subject to the settlement agreement would be issued. Alternative A would not change the current management goals, objectives, and direction of the lease areas as specified in the 2007 HFO RMP. Consequently, this alternative would not create a conflict with existing land-use authorizations. Endangered species stipulations would apply to each of the 14 leases, while new NSO stipulations would not apply. Given the application of the 2007 HFO RMP as well as endangered species stipulations, the 14 leases would have a negligible impact on land use authorizations under Alternative A, Subalternative 1.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impact would occur.

4.19.4 Impacts of Alternative B

Impacts from Oil and Gas Development

Under Alternative B, 39,000 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations. Open lease areas are restricted to Federal mineral estate within the boundaries of oil and gas fields plus a 0.5-mile buffer as defined by DOGGR.

Alternative B would designate the least acreage of Federal mineral estate open to leasing among all alternatives, which would restrict the BLM's options for locating ground disturbance activities. However, under each of the alternatives new oil and gas well locations would likely be within or near established producing oil and gas fields. No exploratory wildcat wells would be developed. Surface disturbance impacts resulting from Alternative B would be long-term, but would be moderate given the expected proximity of new oil and gas development to existing production areas.

Impacts from Management Actions

Unlike Alternative A, Alternative B would require CSU stipulations (see Appendix C) on all Federal mineral estate open to oil and gas leasing, which are defined in the management actions in Section 2.7 as follow:

- **ENERG-A2.** Public lands within oil and gas fields plus a 0.5-mile buffer defined by DOGGR would be open to mineral leasing; all other public lands would be closed to mineral leasing.
- **ENERG-A3.** Require CSU stipulations on all public lands open to mineral leasing.

Areas subject to the above management actions could restrict the placement or routing of oil and gas infrastructure (i.e., roads or pipelines), which may limit access or delay energy projects. The above management actions would severely restrict oil and gas extraction in areas of "high oil and gas occurrence potential," and the BLM would likely grant non-energy land use authorizations in areas closed to oil and gas leasing. However, the BLM would apply the above management actions to all land management decisions under Alternative B, thereby avoiding conflicts between existing authorizations and future land uses. Impacts from management actions would be negligible.

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative B.

Leases Subject to Settlement Agreement

Under Alternative B, approximately 78 percent of the 14 non-NSO leases would be closed to leasing. Unlike Alternative A, Alternative B would change the current management goals, objectives, and direction of the lease areas from what was specified in the 2007 HFO RMP. Non-energy land use authorizations that may be granted in this area could conflict with existing oil and gas activities, which may result in moderate impacts under Alternative B, similar to the larger Planning Area. Such impacts would be greater than the negligible impacts associated with Alternatives A, C, and F. The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended.

4.19.5 Impacts of Alternative C

Impacts from Oil and Gas Development

Under Alternative C, approximately 368,800 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 29,800 would be open with NSO. The designated open lease areas would include Federal mineral estate within high oil and gas occurrence potential areas or within the boundaries of oil and gas fields plus a 0.5-mile buffer as defined by DOGGR, with the exception of core population areas of the kangaroo rat in the vicinity of the Panoche, Griswold, Tumey, and Ciervo Hills which are closed to leasing.

Alternative C would designate more acreage of Federal mineral estate open to leasing than Alternatives B and D, which would provide the BLM with greater flexibility in identifying sites for locating ground disturbance activities than under those alternatives. However, under each of the alternatives new oil and gas well locations would most likely be within or near established producing oil and gas fields. Surface disturbance impacts associated with oil and gas development would be long-term, but would be moderate under Alternative C given the expected proximity of new oil and gas development to existing production areas.

Impacts from Management Actions

For each alternative, new oil and gas related land use authorizations would be considered on a case-by-case basis but denied in exclusion areas. Unlike Alternative A but similar to Alternative B, Alternative C would require CSU stipulations on all Federal mineral estate open to oil and gas leasing. Under Alternative C, approximately 29,800 acres would be subject to NSO stipulations with implementation of the following new management actions that would apply to Alternative C:

- **ENERG-A3.** Require CSU stipulations on all public lands open to mineral leasing.
- **ENERG-A4.** Public lands within areas of high oil and gas potential or public lands within oil and gas fields plus a 0.5-mile buffer defined by DOGGR would be open to mineral leasing, with the exception of core population areas of the kangaroo rat in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills which are closed to leasing. Public lands within areas of moderate, low, and no potential would be closed to mineral leasing.
- **ENERG-A5.** Require NSO stipulations for public lands open to leasing which include: (1) threatened and endangered species critical habitat; (2) BLM developed recreation and administrative sites; and (3) special status split estate lands (e.g., state parks, county parks, conservation easements, land trusts, and scenic designations).

Areas subject to the above management actions could restrict the placement or routing of oil and gas infrastructure (i.e., roads or pipelines), which may limit access or delay energy projects. The above management actions would restrict oil and gas extraction in areas of "high oil and gas occurrence potential," and the BLM would likely grant non-energy land use authorizations in areas closed to leasing. However,

the above management actions would also avoid conflicts between oil and gas development and existing BLM land management and land use authorizations applicable to developed recreation sites and other areas of special designation (i.e., state parks, county parks, conservation easements, land trusts, scenic designations). With application of these management actions, impacts to land use authorizations would be negligible.

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative C.

Leases Subject to Settlement Agreement

Under Alternative C, the 14 non-NSO leases would be in BLM-managed areas that are open to leasing with CSU stipulations. Alternative C would not change the current management goals, objectives, and direction of the 14 leases, and no NSO stipulations would apply to the lease areas. Given the application of the 2007 HFO RMP, the 14 leases would have a negligible impact on land use authorizations under Alternative C, similar to the larger Planning Area. Likewise, the BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended.

4.19.6 Impacts of Alternative D

Under Alternative D, approximately 121,200 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 16,400 acres would be open to oil and gas leasing with NSO. Open lease areas are restricted to Federal mineral estate underlying BLM surface estate. All BLM split estate lands and the Ciervo-Panoche Natural Area would be closed to leasing. This alternative would designate the second smallest acreage of Federal mineral estate available for oil and gas leasing among all of the alternatives.

As described in Section 2.5.2, the same level of oil and gas development would apply to Alternatives A and C through F (i.e., 206 acres of disturbance). Alternative D would designate less acreage of Federal mineral estate open to leasing than Alternatives A, C, E, and F. The smaller acreage available for leasing would restrict the BLM's options for locating ground disturbance activities. However, under each of the alternatives new oil and gas well locations would most likely be within or near established producing oil and gas fields. Surface disturbance impacts under Alternative D would be long-term, but would be moderate given the expected proximity of new oil and gas development to existing production areas.

Impacts from Management Actions

For each alternative, new oil and gas related land use authorizations would be considered on a case-by-case basis but denied in exclusion areas. Unlike Alternative A but similar to the other alternatives, the new management action ENERG-A3 under Alternative D would establish CSU stipulations on all Federal mineral estate open to oil and gas leasing. Under Alternative D, approximately 16,400 acres would be subject to NSO stipulations with implementation of the following new management actions that would apply to Alternative D:

- **ENERG-COM3.** Require No Surface Occupancy stipulations on all R&PP lease areas.
- **ENERG-C1.** Oil and gas leases in ACECs would stipulate No Surface Occupancy in special status species habitat (BLM, 2007; Appendix D).
- **ENERG-A3.** Require CSU stipulations on all public lands open to mineral leasing.
- **ENERG-A7.** Federal mineral estate underlying BLM surface estate would be open to mineral leasing. Split estate public lands would be closed to mineral leasing.

Areas subject to stipulations (see Appendix C) could restrict the placement or routing of oil and gas infrastructure (i.e., roads or pipelines), which may limit access or delay energy projects. The above management actions would restrict oil and gas extraction in areas of "high oil and gas occurrence potential." However, the application of NSO stipulations over a larger management area under Alternative D would allow greater flexibility in the BLM's management of oil and gas resources compared to the restrictions that apply to Alternative B's smaller management area. Given that the BLM would apply the above management actions to all land management decisions under Alternative D, impacts to land use authorizations would be negligible.

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative D.

Leases Subject to Settlement Agreement

Under Alternative D, approximately 75 percent of the 14 non-NSO leases would be closed to leasing (see Tables 2-2 and 2-3). Unlike Alternative A, Alternative D would change the current management goals, objectives, and direction of the lease areas from what was specified in the 2007 HFO RMP. Non-energy land use authorizations that may be granted in this area could conflict with existing oil and gas activities, which may result in moderate impacts under Alternative D. Such impacts would be greater than the negligible impacts associated with Alternatives A and C. The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended.

4.19.7 Impacts of Alternative E

Impacts from Oil and Gas Development

Under Alternative E, approximately 487,200 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 206,400 acres would be open with NSO. The designated open lease areas would include Federal mineral estate outside of a California DWR Bulletin 118, Groundwater Basin or Sub-basin.

As described in Section 2.5.2, the same level of oil and gas development would apply to Alternatives A and C though F (i.e., 206 acres of disturbance). Alternative E would designate the third largest acreage of Federal mineral estate open to leasing (Alternative A and F being the largest), which would provide the BLM with greater flexibility in identifying sites for locating ground disturbance activities than under Alternatives B, C, and D. However, under each of the alternatives new oil and gas well locations would most likely be within or near established producing oil and gas fields. Surface disturbance impacts associated with oil and gas development would be long-term, but would be moderate under Alternative E given the expected proximity of new oil and gas development to existing production areas.

Impacts from Management Actions

For each alternative, new oil and gas related land use authorizations would be considered on a case-by-case basis but denied in exclusion areas. Unlike Alternative A but similar to the other alternatives, Alternative E would require CSU stipulations on all Federal mineral estate open to oil and gas leasing with implementation of ENERG-A3. Under Alternative E, approximately 206,400 acres would be subject to NSO stipulations under ENERG-A9. The management actions identified in Section 2.11 for Alternative E would be the following:

- **ENERG-A3.** Require CSU stipulations on all public lands open to mineral leasing.
- **ENERG-A8.** Public lands outside of California DWR Bulletin 118 groundwater basins and sub-basins would be open to mineral leasing. Public lands within California DWR Bulletin 118 groundwater basins and sub-basins would be closed to mineral leasing.

- **ENERG-A9.** Require NSO stipulations for public lands open to leasing which include: (1) 12-digit Hydrologic Unit Codes (HUCs) intersecting EPA impaired, perennial surface waters (BLM surface and split estate); (2) 12-digit HUCs intersecting non-impaired, perennial surface waters that intersect split estate; (3) 12-digit HUC subwatersheds with the highest aquatic intactness score; (4) 0.25 miles from non-impaired, perennial surface waters; and (5) 0.25 miles from eligible Wild and Scenic Rivers.

Areas subject to the above management actions could restrict the placement or routing of oil and gas infrastructure (i.e., roads or pipelines), which may limit access or delay energy projects. However, the above management actions would effectively avoid conflicts between oil and gas development and existing BLM land management and land use authorizations. Of all the alternatives, Alternative E would establish the largest area to which stipulations would apply to oil and gas leases. With application of these management actions and resulting stipulations, impacts to land use authorizations would be negligible.

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative E.

Leases Subject to Settlement Agreement

Under Alternative E, approximately 57 percent of the 14 non-NSO leases would be open to leasing with CSU stipulations, 41 percent would be open in areas subject to NSO stipulations, and two percent would be closed to leasing (see Tables 2-2 and 2-3). Unlike Alternative A, Alternative E would incorporate new restrictions in the current management goals, objectives, and direction of the lease areas from what was specified in the 2007 HFO RMP. While stipulations under Alternative E would not conflict with existing land-use authorizations, they would introduce restrictions to oil and gas extraction in areas of "high oil and gas occurrence potential." Non-energy land use authorizations that may be granted in this area could conflict with existing oil and gas activities, which may result in moderate impacts under Alternative E. Such impacts would be greater than the negligible impacts associated with Alternatives A, B, and C. The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended.

4.19.8 Impacts of Alternative F

Under Alternative F, approximately 683,100 acres of BLM oil and gas Federal mineral estate are identified as open to oil and gas leasing with CSU stipulation(s), 42,400 acres would be subject to NSO stipulations, and 67,500 acres would be closed to leasing. This alternative would designate the greatest acreage of Federal mineral estate available for oil and gas leasing among all of the alternatives (equal with Alternative A). The greater acreage available for leasing under Alternative F could allow greater flexibility to BLM related to options for locating ground disturbance activities, compared to Alternative B through E. However, under all alternatives, new oil and gas well locations would most likely be within or near established producing oil and gas fields. Surface disturbance impacts under Alternative F would be long-term, but would be moderate given the expected proximity of new oil and gas development to existing production areas.

Impacts from Management Actions

Under Alternative F, approximately 42,400 acres would be subject to NSO stipulations with implementation of the following management actions, which are identified in Section 2.6:

- **ENERG-A3.** Require CSU stipulations on all public lands open to mineral leasing.
- **ENERG-A10.** Require NSO stipulations for public lands open to leasing which include: (1) Joaquin Rocks ACEC; (2) ACECs within Ciervo-Panoche Natural Area; and (3) Giant kangaroo rat core population area.

Areas subject to stipulations (see Appendix C) could restrict the placement or routing of oil and gas infrastructure (i.e., roads or pipelines), which may limit access or delay energy projects. The above management actions would restrict oil and gas extraction in areas of "high oil and gas occurrence potential." Given that the BLM would apply the above management actions to all land management decisions under Alternative F, impacts to land use authorizations would be negligible.

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative F.

Leases Subject to Settlement Agreement

Under Alternative F, the 14 non-NSO leases would be in BLM-managed areas that are open to leasing with CSU stipulations. Alternative F would not change the current management goals, objectives, and direction of the 14 leases, and no NSO stipulations would apply to the lease areas. Given the application of the 2007 HFO RMP, the 14 leases would have a negligible impact on land use authorizations under Alternative F, similar to the larger Planning Area. Likewise, the BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended.

4.20 Utility Corridors and Communication Sites

4.20.1 Introduction

This section describes the potential impacts to utility corridors and communication sites within the regions of the CCFO Planning Area that would be applicable to the Proposed RMPA. Impacts to transportation corridors within the CCFO Planning Area are discussed in Section 4.18 (Transportation and Access).

Methods of Analysis

When considering the existing oil and gas industry within the CCFO Planning Area, the regional study area for impacts to utility corridors and communication sites includes BLM-administered surface land and split estate land within the CCFO Planning Area. This area of analysis can be further defined to include only Federal mineral estate in the identified regions of high oil and gas occurrence potential, which is where future oil and gas development is most likely to occur (see Figure 3.20-1). Types of adverse effects on utility corridors and communication sites would include the following:

- Interference with the operations of existing utility infrastructure and communication facilities.
- Construction impacts from new utility infrastructure associated with oil and gas development under the Proposed RMPA.

BLM is unable to quantify impacts on utilities and associated infrastructure from leasing and development of the Federal mineral estate administered by the CCFO within the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.20. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects on lands and realty from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground. Other incomplete or unavailable information includes the type(s) of development(s) and site-specific resource conditions because it's impossible for BLM to know how, where, or when leases would be developed. Therefore, BLM is unable to quantify effects on utility corridors and communication sites from the range of alternatives. As a result, the evaluation of such impacts considers current resource conditions described in Section 3.20, and the regulatory framework described in Appendix J.

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of federal minerals in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99 percent) of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects on utility corridors in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

Assumptions

The analysis is based on the following assumptions:

- The same level of oil and gas development under the 2015 RFD Scenario would apply to Alternatives A and C through F (i.e., 37 exploratory and development wells on 206 acres of disturbance). Alternative B assumes that all development would be within existing oil and gas fields only (up to 32 development wells on 179 acres of disturbance), so no additional exploratory wildcat wells would be developed.

- All surface-disturbing activities related to the 2015 RFD Scenario would likely occur on BLM-administered mineral estate in Fresno, Monterey, and San Benito Counties within the area of high oil and gas occurrence potential (shown in Figure 5-1) for the CCFO Planning Area.
- New oil and gas well locations developed under the 2015 RFD Scenario would likely be within, or proximate to, established producing oil and gas fields or near lands that are already leased for such activities.
- Ancillary facilities for oil and gas production (e.g., pipelines, compressor stations, etc.) and downstream activities such as oil processing at refineries and natural gas transmission and distribution are separate activities that would not be substantially affected by the RFD Scenario, 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.
- Electricity providers identified in Section 3.20 are assumed to have sufficient capacities to serve an increased electricity demand from oil and gas development within the CCFO Planning Area.

4.20.2 Impacts Common to All Alternatives

None of the Proposed RMPA alternatives would alter the use or designation of existing utility corridors within the CCFO Planning Area. Future expansion of utility rights in existing facilities and easements would have negligible impacts, because utility corridors would maintain their current designation and would continue to meet the needs of the State and local communities.

As discussed in Section 2.3, the 2015 RFD Scenario assumes that the current development trends in this region are likely to continue for the next 15 to 20 years. It is estimated that during the life of this RMPA, 37 total exploratory and development wells would be developed on up to 206 acres. This estimate includes all anticipated forms of ground disturbance such as the construction of well pads, roads, onsite facilities, and pipelines. Well stimulation technologies (e.g., hydraulic fracturing, acid matrix stimulation, acid fracturing, etc.) and enhanced oil recovery techniques (e.g., cyclic steam, steam flood, water flood) may be used on any or all of the 37 wells during their life cycle. Utility-related impacts that would be the same for all alternatives include the following:

- **Oil and Gas Pipelines.** Under Alternatives A through F (except Alternative B), the proposed 37 wells (32 wells for Alternative B) would be a minor expansion of existing oil and gas development and are not expected to require extensive new pipeline infrastructure. New oil and gas leases would generally construct connectors to existing pipeline facilities over a distance that is likely to be less than 10 miles. Surface disturbance from the construction of pipeline connectors is included in the total estimate of up to 206 acres of disturbance.
- **Transmission Lines.** Under Alternatives A through F, well stimulation activities that may occur with the proposed oil and gas developments would require electricity from local providers. Extending existing power lines to provide a permanent supply of electricity to a new well pad or facility may be necessary. Since a new distribution power line ties into an existing distribution line or substation, the tie-in location generally occurs in previously disturbed areas and along existing ROWs or roads where the existing power line or substation is located. Electric distribution line extensions consist of the installation of new power poles, and may include vehicular travel for power pole installation in undisturbed areas. Surface disturbance from the construction of tie-ins is included in the total estimate of up to 206 acres of disturbance.
- **Communication Sites.** Under Alternatives A through F, communication facilities and ancillary equipment are permitted on public lands through ROW authorizations issued by the BLM. Per the discretion of the BLM, communication ROWs may be limited to currently occupied sites. Future oil and gas development would not be compatible with existing communication sites. As the BLM would review all ROW requests prior to their authorization, the BLM would avoid co-locating land uses or ROWs with conflicting operations.

Best Management Practices

The BLM has developed requirements for conducting environmentally responsible oil and gas operations on BLM-administered surface land and split estate land. Appendix D (Best Management Practices) includes a compilation of existing BLM policies, guidelines, and practices designed to prevent unnecessary or undue degradation of public land resources. The BLM has also identified specific oil and gas development requirements to minimize environmental impacts, which are separately published in the Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (commonly referred to as The Gold Book). For each Application for a Permit to Drill (APD), the BLM would select and apply BMPs based on site-specific conditions to meet a variety of resource objectives for specific management actions.

4.20.3 Impacts of Alternative A (No Action)

This alternative maintains the management direction of the 2007 HFO RMP. Any new lease applications would be reviewed by the BLM to avoid conflicts with existing land uses or ROW designations. With BLM's management of ROW authorizations, none of the alternatives would interfere with the operations of existing utility infrastructure and communication facilities. Impacts to existing utility corridors and communication sites would be negligible.

As described in Section 2.5.2, the same level of oil and gas development would apply to each alternative except Alternative B (i.e., 37 wells and 206 acres of disturbance); consequently, adverse effects from the construction of new utility facilities associated with oil and gas development would be identical for Alternatives A, C, D, E, and F.

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative A.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A Subalternative 1, the 14 non-NSO leases subject to the settlement agreement would be issued. New oil and gas wells would be likely to require short segments of new pipeline to reach existing pipeline infrastructure serving the San Ardo and Vallecitos oil and gas fields near the lease areas. Therefore, the types of potential impacts would be similar to those discussed for the larger Planning Area. Surface disturbance impacts associated with oil and gas development would be long-term, but would be moderate under Alternative A Subalternative 1 given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BLM standards and guidelines for oil and gas operations. Adverse effects from new utility facilities would be less severe (i.e., minor) under Alternatives B and D, which would close more than three-fourths of the proposed lease areas to oil and gas development.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impact would occur.

4.20.4 Impacts of Alternative B

Under Alternative B, approximately 39,000 acres of Federal mineral estate would be open to oil and gas leasing. New oil and gas well locations would be within, or proximate to, established producing oil and gas fields or near lands that are already leased for such activities. As part of each future permit or authorization for a facility, the BLM would identify BMPs (see Appendix D) to be implemented during construction and operation of all oil and gas ancillary facilities.

Alternative B would limit oil and gas leasing to Federal mineral estate within the boundaries of oil and gas fields plus a 0.5-mile buffer defined by DOGGR. Therefore, the 3 to 5 exploratory wildcat wells discussed

in the RFD Scenario would not be developed. Under Alternative B, surface disturbance impacts associated with oil and gas development would be long-term but moderate given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BMPs for oil and gas operations. Slightly less oil and gas development would apply to Alternative B (i.e., 32 wells and 179 acres of disturbance); consequently, adverse effects from the construction of new utility facilities associated with oil and gas development under Alternative B could be slightly less.

Impacts to existing utility corridors and communication sites would be negligible. With BLM's management of ROW authorizations, none of the alternatives would interfere with the operations of existing utility infrastructure and communication facilities.

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative B.

Leases Subject to Settlement Agreement

Under Alternative B, approximately 78 percent of the 14 non-NSO leases would be closed to leasing (see Tables 2-2 and 2-3). The types of potential impacts for the open portions of these lease areas would be similar to those discussed for the larger Planning Area. Surface disturbance impacts associated with oil and gas development would be long-term, but minor under Alternative B given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BLM standards and guidelines for oil and gas operations. The minor effects from Alternative B would be similar to Alternative D as both alternatives would allow less than one-quarter of the proposed leases to be open to oil and gas development. Impacts from the 14 non-NSO leases would be greater under Alternatives A, C, E, and F, which would allow between 98 to 100 percent of the 14 proposed lease areas to be open to oil and gas development.

4.20.5 Impacts of Alternative C

Under Alternative C, approximately 368,800 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 29,800 would be open with NSO. New oil and gas well locations would likely be within, or proximate to, established producing oil and gas fields or near lands that are already leased for such activities. As part of each future permit or authorization for a facility, the BLM would identify BMPs (see Appendix D) to be implemented during construction and operation of all oil and gas ancillary facilities. Under Alternative C, surface disturbance impacts associated with oil and gas development would be long-term but moderate given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BMPs for oil and gas operations. As described in Section 2.5.2, the same level of oil and gas development would apply to Alternatives A and C through F (i.e., 37 wells and 206 acres of disturbance); consequently, adverse effects from the construction of new utility facilities associated with oil and gas development would be identical for these alternatives.

Impacts to existing utility corridors and communication sites would be negligible. With BLM's management of ROW authorizations, none of the alternatives would interfere with the operations of existing utility infrastructure and communication facilities.

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative C.

Leases Subject to Settlement Agreement

Under Alternative C, the 14 non-NSO leases would be in BLM-managed areas that are open to leasing. New oil and gas wells would be likely to require short segments of new pipeline to reach existing pipeline infrastructure serving the San Ardo and Vallecitos oil and gas fields near the lease areas. Therefore, the types of potential impacts would be similar to those discussed for the larger Planning Area. Surface disturbance impacts associated with oil and gas development would be long-term, but would be moderate under Alternative C given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BLM standards and guidelines for oil and gas operations. Adverse effects from new utility facilities would be less severe (i.e., minor) under Alternatives B and D, which would close more than 75 percent of the proposed lease areas to oil and gas development.

4.20.6 Impacts of Alternative D

Under Alternative D, approximately 121,200 acres of Federal mineral estate would be open to oil and gas leasing and 16,400 acres would be open with NSO. New oil and gas well locations would likely be within, or proximate to, established producing oil and gas fields or near lands that are already leased for such activities. As part of each future permit or authorization for a facility, the BLM would identify BMPs (see Appendix D) to be implemented during construction and operation of all oil and gas ancillary facilities. Under Alternative D, surface disturbance impacts associated with oil and gas development would be long-term but moderate given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BMPs for oil and gas operations. As described in Section 2.5.2, the same level of oil and gas development would apply to each alternative (i.e., 37 wells and 206 acres of disturbance); consequently, adverse effects from the construction of new utility facilities associated with oil and gas development would be identical for Alternatives A through F.

Impacts to existing utility corridors and communication sites would be negligible. With BLM's management of ROW authorizations, none of the alternatives would interfere with the operations of existing utility infrastructure and communication facilities.

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative D.

Leases Subject to Settlement Agreement

Under Alternative D, approximately 25 percent of the proposed 14 non-NSO leases would be open to leasing with CSU stipulations (see Tables 2-2 and 2-3). New oil and gas wells would be likely to require short segments of pipeline to reach existing pipeline infrastructure serving the San Ardo and Vallecitos oil and gas fields near the lease areas. Therefore, the types of potential impacts would be similar to those discussed for the larger Planning Area. Surface disturbance impacts associated with oil and gas development would be long-term, but minor under Alternative D given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BLM standards and guidelines for oil and gas operations. The minor effects from Alternatives B and D would be similar as both alternatives would allow less than 25 percent of the proposed leases to be open to oil and gas development. Impacts from the 14 non-NSO leases would be greater under Alternatives A, C, E, and F, which would allow between 98 to 100 percent of the 14 proposed lease areas to be open to oil and gas development.

4.20.7 Impacts of Alternative E

Under Alternative E, approximately 487,200 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 206,400 acres would be open with NSO. New oil and gas well locations

would likely be within, or proximate to, established producing oil and gas fields or near lands that are already leased for such activities. As part of each future permit or authorization for a facility, the BLM would identify BMPs (see Appendix D) to be implemented during construction and operation of all oil and gas ancillary facilities. Under Alternative E, surface disturbance impacts associated with oil and gas development would be long-term but moderate given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BMPs for oil and gas operations. As described in Section 2.5.2, the same level of oil and gas development would apply to each alternative (i.e., 37 wells and 206 acres of disturbance); consequently, adverse effects from the construction of new utility facilities associated with oil and gas development would be identical for Alternatives A through F.

Impacts to existing utility corridors and communication sites would be negligible. With BLM's management of ROW authorizations, none of the alternatives would interfere with the operations of existing utility infrastructure and communication facilities.

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative E.

Leases Subject to Settlement Agreement

Under Alternative E, approximately 98 percent of the proposed 14 non-NSO leases would be open to leasing with CSU or NSO stipulations (see Tables 2-2 and 2-3). New oil and gas wells would be likely to require short segments of pipeline to reach existing pipeline infrastructure serving the San Ardo and Vallecitos oil and gas fields near the lease areas. Therefore, the types of potential impacts would be similar to those discussed for the larger Planning Area. Surface disturbance impacts associated with oil and gas development would be long-term, but would be moderate under Alternative E given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BLM standards and guidelines for oil and gas operations. Adverse effects from new utility facilities would be less severe (i.e., minor) under Alternatives B and D, which would close more than 75 percent of the proposed lease areas to oil and gas development.

4.20.8 Impacts of Alternative F

Under Alternative F, approximately 683,100 acres of BLM oil and gas Federal mineral estate are identified as open to oil and gas leasing with CSU stipulation(s), 42,400 acres would be subject to NSO stipulations, and 67,500 acres would be closed to leasing. New oil and gas well locations would likely be within, or proximate to, established producing oil and gas fields or near lands that are already leased for such activities. As part of each future permit or authorization for a facility, the BLM would identify BMPs (see Appendix D) to be implemented during construction and operation of all oil and gas ancillary facilities. Under Alternative F, surface disturbance impacts associated with oil and gas development would be long-term but moderate given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BMPs for oil and gas operations. As described in Section 2.3, the same level of oil and gas development would apply to each alternative (i.e., 37 wells and 206 acres of disturbance), except Alternative B (32 wells and 179 acres of disturbance); consequently, adverse effects from the construction of new utility facilities associated with oil and gas development would be identical to Alternatives A, and C through F.

Impacts to existing utility corridors and communication sites would be negligible. With BLM's management of ROW authorizations, none of the alternatives would interfere with the operations of existing utility infrastructure and communication facilities. The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative F. However, adverse effects from new utility

facilities would be less severe (i.e., minor) under Alternatives B through E, which would close more lease areas to oil and gas development compared to Alternative F.

Leases Subject to Settlement Agreement

Under Alternative F, the 14 non-NSO leases would be in BLM-managed areas that are open to leasing. New oil and gas wells would be likely to require short segments of new pipeline to reach existing pipeline infrastructure serving the San Ardo and Vallecitos oil and gas fields near the lease areas. Therefore, the types of potential impacts would be similar to those discussed as common to all alternatives for the larger Planning Area. Surface disturbance impacts associated with oil and gas development would be long-term, but would be moderate under Alternative F given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BLM standards and guidelines for oil and gas operations.

4.21 Wild and Scenic Rivers

4.21.1 Introduction

As discussed in Section 3.21, the BLM determined that none of the 11 eligible river segments in the Central Coast Field Office (CCFO) Planning Area were suitable for inclusion in the National Wild and Scenic River (NWSR) System (BLM, 2014; Appendix VI). However, the BLM must implement the management direction provided in Manual 6330 to protect an eligible river's outstanding remarkable values until Congress designates the river or releases it for other uses. This section provides an analysis of the potential impacts of the Proposed RMPA on eligible Wild and Scenic Rivers within the CCFO Planning Area, and recommends mitigation if necessary to minimize or avoid impacts. Designated NWSRs would not cross or be located in the vicinity of Federal mineral estate (see Section 3.21.4), and as such would not be affected by the Proposed RMPA.

Methods of Analysis

The area of analysis includes eligible NWSR segments that are within the CCFO Planning Area. Impacts to Wild and Scenic Rivers would include the following:

- Direct impacts include any action that would modify the watercourse/streambed (e.g., impoundments, channelization or diversions).
- Indirect impacts would result from actions (either BLM or others) that remove water from the river above the segment and reduce in-stream flows below an acceptable level, or contribute to degradation of the river's outstanding remarkable value.

BLM is unable to quantify impacts on wild and scenic rivers from leasing and development of the Federal mineral estate administered by the CCFO within the range of alternatives because the exact timing and/or location of future leasing and development activities is not available or attainable. Therefore, the evaluation of such impacts is described qualitatively based on the RFD scenario and current resource conditions discussed in Section 3.21. The RMPA is a planning document, and indirect and cumulative effects of leasing and development inform the planning decision. A qualitative analysis for these impacts, as opposed to a quantitative analysis is appropriate because it provides a reasonable forecast of effects, but does not speculate on the direct effects on wild and scenic rivers from the range of alternatives presented in the RMPA. In addition, the impacts to the 14 potential leases are discussed to the same extent because actual, direct on the ground effects are identified, if at all, at the lease development, or APD stage when wells are actually proposed to be drilled into the surface of the ground. Other incomplete or unavailable information includes the type(s) of development(s) and site-specific resource conditions because it's impossible for BLM to know how, where, or when leases would be developed. Therefore, BLM is unable to quantify effects on eligible river segments under the range of alternatives. As a result, the evaluation of such impacts considers current resource conditions described in Section 3.21, and the regulatory framework described in Appendix J.

The lack of information does not hinder the BLM's evaluation of impacts to the environment from future leasing and development of Federal mineral estate in the Planning Area because the RFD Scenario for oil and gas in the CCFO provides a reliable estimate for the total acres of surface disturbance from the development of up to 37 new wells (and related facilities) on new or existing leases. The RFD Scenario also indicates the majority (99 percent) of future oil and gas activity in the planning area would occur inside active fields in Fresno, San Benito, or Monterey Counties. This allows BLM to determine the potential direct effects of the RMPA, and the 14 potential leases, and the forecasted indirect effects on eligible river segments in proximity to these fields and make a reasoned choice among the range of alternatives considered in this Proposed RMPA.

Assumptions

The analysis is based on the following assumption:

- All river segments found to be eligible for inclusion in the NWSR System are placed under protective management by the BLM. Subject to valid existing rights, the BLM is required to protect the free-flowing characteristics and outstandingly remarkable values in the stream corridors.

4.21.2 Impacts Common to All Alternatives

As discussed in Section 3.21.2, the BLM must provide protective measures to maintain the outstanding remarkable values of all eligible NWSR segments. Outstandingly remarkable values for eligible river segments within the CCFO Planning Area are listed in Table 3.21-1.

NWSR designation ensures that many forms of development do not compromise a river's free-flowing character, water quality and quantity, or social and ecological values. As described in Section 3.21.2, the designated NWSR boundary generally extends 0.25 miles from either bank. Activities such as mining and oil and gas drilling may be restricted by a NWSR designation if they cannot be undertaken without harming a river's free-flowing condition, water quality, or remarkable values.

None of the alternatives under the Proposed RMPA would alter the designation of eligible river segments, which can only be done through Congressional legislation. In compliance with the Wild and Scenic Rivers Act (see Section 3.21), the BLM would be required to enact management restrictions to protect eligible NWSRs and these restrictions would apply to all of the Proposed RMPA alternatives. The following impact analysis identifies whether an alternative would require additional stipulations to protect the characteristics and remarkable values of eligible NWSR segments.

4.21.3 Impacts of Alternative A (No Action)

Under Alternative A, the following eligible NWSR segments would extend into Federal mineral estate open to oil and gas development: Cantua Creek, Clear Creek, East Fork San Carlos Creek, Larious Creek, Picacho Creek, San Benito River, and White Creek. The majority of the Federal mineral estate that may be open to leasing would not be subject to NSO stipulations under Alternative A. Only a small area of Federal mineral estate subject to NSO stipulations would be crossed by the Cantua Creek segment.

Given the lack of stipulations along the eligible NWSR segments, major impacts could occur during oil and gas development activities under Alternative A. For example, surface disturbance during construction and maintenance (e.g., establishment of access roads, wellpads, flowlines, pipelines, etc.) could increase soil erosion, which may increase turbidity and sedimentation in nearby streams. Vegetation clearing required during construction activities would further contribute to soil erosion. During construction and operation, hazardous materials could be released from construction vehicles, wells, or flowlines, which may contaminate local waterways. These impacts would be long-term and could permanently degrade the rivers' outstanding remarkable value(s).

Measures in Sections 4.8 (Surface Water Resources), 4.10 (Biological Resources – Vegetation), 4.11 (Biological Resources – Wildlife Habitat), 4.12 (Biological Resources – Special Status Species), and 4.13 (Visual Resource Management) may be required and would help protect NWSRs. However, without stipulations, impacts to eligible NWSRs under Alternative A would be the most severe of all the Proposed RMPA alternatives.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A, the 14 proposed leases would be open to oil and gas development and would not be subject to NSO stipulations. There are no designated NWSR within the leases subject to settlement agreement. Of the 11 eligible NWSR segments in the CCFO Planning Area, two river segments are in close proximity to the non-NSO leases: the East Fork San Carlos Creek segment extends into a non-NSO lease

(Lease CACA 053834), and the Larious Creek segment is less than one mile south of the non-NSO leases (Leases CACA 053832 and 053835). Given the lack of stipulations that would apply to oil and gas development activities (e.g., sedimentation, water contamination) near eligible river segments, potential impacts could occur, similar to those discussed for the Planning Area. Although these eligible river segments were not recommended for inclusion in the NWSR System, these impacts would be long-term and could permanently degrade the rivers' outstanding remarkable value(s). Biological resources and visual resource management measures to reduce impacts could be implemented similar to those discussed for Alternative A. Impacts under Alternatives A (Subalternative 1) and C would be similar given the lack of NSO stipulations for both alternatives. Impacts would be less severe under Alternatives B, D, and E due to the application of stipulations or the closure of some lease areas to oil and gas development (see Sections 4.21.4 through 4.21.8).

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Hollister I should not have been issued, and the 12 prospective non-NSO leases as identified in Hollister II would not be issued. As such, no resource impact would occur.

4.21.4 Impacts of Alternative B

Under Alternative B, none of the eligible NSWR segments would extend into Federal mineral estate open to oil and gas development. All Federal mineral estate traversed by the eligible NWSR segments would be closed to leasing. Indirect impacts may occur if oil and gas activities along a non-designated upper river area would contribute to adverse effects on lower river segments under designation. However, these indirect effects are not likely to occur under the Proposed RMPA given that the upper reaches of the eligible river segments are located in the Clear Creek Serpentine ACEC, which is closed to oil and gas development. As no oil and gas development activities would occur in the vicinity of the eligible portions of the river segments, impacts would be expected to be negligible. Alternative B would have the least impact to NWSRs of all the Proposed RMPA alternatives.

No mitigation is recommended for Alternative B.

Leases Subject to Settlement Agreement

While 21 percent of the acreage for the proposed non-NSO leases would be open to oil and gas development under Alternative B, none of the open lease areas would be traversed by an eligible NWSR segment. As no oil and gas development activities would occur in the vicinity of the eligible portions of the river segments, impacts would be expected to be negligible. Negligible impacts under Alternative B would be similar to Alternative D, which would also close Federal mineral estate to leasing in the vicinity of eligible NWSRs, and to Alternative A (Subalternative 2) where no impacts would occur. Impacts would be more severe under Alternatives A (Subalternative 1), C, E, and F given that these alternatives include open lease areas near eligible NWSRs.

4.21.5 Impacts of Alternative C

Under Alternative C, the following eligible NWSR segments would extend into Federal mineral estate open to oil and gas development: Cantua Creek, East Fork San Carlos Creek, and White Creek. Federal mineral estate open to leasing under Alternative C would not be subject to NSO stipulations in the vicinity of eligible NWSRs.

Alternative C includes a greater area closed to oil and gas development along the eligible NWSR segments than Alternatives A, D, E, and F. However, given the lack of stipulations that would apply to the open areas around the eligible segments, major impacts could still occur during oil and gas development activities. For example, surface disturbance during construction and maintenance could increase soil erosion, which may increase turbidity and sedimentation in nearby streams. During construction and

operation, hazardous materials could be released from construction vehicles, wells, or flowlines, which may contaminate local waterways. These impacts would be long-term and could permanently degrade the rivers' outstanding remarkable value(s).

Without stipulations, impacts to NWSRs under Alternative C would be more severe than Alternative B. Impacts may be less severe than Alternatives A, D, and F due to the greater area closed to leasing near eligible NWSRs under Alternative C. The degree of impact for Alternatives C and E may be similar, as they both increase either the acreage of areas closed to leasing or subject to NSO stipulations.

In order to protect eligible NWSRs from impacts to their free-flowing conditions, water quality, or outstanding remarkable values, Mitigation Measure WSR-1 (Apply Lease Stipulations along Eligible NWSR Segments) in Appendix C is recommended for Alternative C. Additional measures discussed in Sections 4.8 (Surface Water Resources), 4.10 (Biological Resources – Vegetation), 4.11 (Biological Resources – Wildlife Habitat), 4.12 (Biological Resources – Special Status Species), and 4.13 (Visual Resource Management) may be required and would help ensure resource protection for NWSRs.

Leases Subject to Settlement Agreement

Under Alternative C, the 14 proposed leases would be open to oil and gas development and would not be subject to NSO stipulations. There are no designated NWSR within the leases subject to settlement agreement. Of the 11 eligible NWSR segments in the CCFO Planning Area, two river segments are in close proximity to the non-NSO leases: the East Fork San Carlos Creek segment extends into a non-NSO lease (Lease CACA 053834), and the Larious Creek segment is less than one mile south of the non-NSO leases (Leases CACA 053832 and 053835). Given the lack of stipulations that would apply to oil and gas development activities (e.g., sedimentation, water contamination) near eligible river segments, potential impacts could occur, similar to those discussed for the larger Planning Area. Although these eligible river segments were not recommended for inclusion in the NWSR System, these impacts would be long-term and could permanently degrade the rivers' outstanding remarkable value(s). Mitigation could be implemented similar to that discussed for Alternative C. Impacts under Alternatives C, A (Subalternative 1), and F would be similar given the lack of NSO stipulations for these alternatives. Impacts would be less severe under Alternatives A (Subalternative 2), B, D, and E due to the application of stipulations or the closure of some lease areas to oil and gas development.

4.21.6 Impacts of Alternative D

Under Alternative D, the following eligible NWSR segments would extend into Federal mineral estate open to oil and gas development: Cantua Creek, East Fork San Carlos Creek, Picacho Creek, San Benito River, and White Creek. Federal mineral estate open to leasing under Alternative D would not be subject to NSO stipulations in the vicinity of eligible NWSRs.

For Alternatives A, D, and F, the designation of Federal mineral estate open or closed to oil and gas development around eligible river segments is similar, with Alternative D having a small increase in the amount of public land closed to leasing near Larious Creek, and East Fork San Carlos Creek, and San Benito River. Alternatively, Alternative A would include a small area of Federal mineral estate subject to NSO stipulations that would be crossed by Cantua Creek.

Given the lack of stipulations along the eligible NWSR segments, major impacts could occur during oil and gas development activities under Alternative D. For example, surface disturbance during construction and maintenance could increase soil erosion, which may increase turbidity and sedimentation in nearby streams. During construction and operation, hazardous materials could be released from construction vehicles, wells, or flowlines, which may contaminate local waterways. These impacts would be long-term and could permanently degrade the rivers' outstanding remarkable value(s).

Without stipulations, impacts to NWSRs under Alternative D would be more severe than Alternatives B, C, and E. Impacts may be slightly less severe than Alternative A and F due to the small increase in acreage closed to leasing near eligible NWSRs under Alternative D.

In order to protect eligible NWSRs from impacts to their free-flowing conditions, water quality, or outstanding remarkable values, Mitigation Measure WSR-1 (Apply Lease Stipulations along Eligible NWSR Segments) in Appendix C is recommended for Alternative D. Additionally measures in Sections 4.8 (Surface Water Resources), 4.10 (Biological Resources – Vegetation), 4.11 (Biological Resources – Wildlife Habitat), 4.12 (Biological Resources – Special Status Species), and 4.13 (Visual Resource Management) may be required and would help ensure resource protection for NWSRs.

Leases Subject to Settlement Agreement

Under Alternative D, the 14 proposed leases that would be in proximity to eligible NWSR segments would be closed to oil and gas development. As no oil and gas development activities would occur in the vicinity of the eligible portions of the river segments, impacts would be negligible. Negligible impacts under Alternatives B and D would be similar as they both close Federal mineral estate to leasing in the vicinity of eligible NWSRs, and Alternative A (Subalternative 2) would have no impacts. Impacts would be more severe under Alternatives A (Subalternative 1), C, E, and F given that these alternatives include open lease areas near eligible NWSRs.

4.21.7 Impacts of Alternative E

Under Alternative E, the following eligible NWSR segments would extend into Federal mineral estate open to oil and gas development: Cantua Creek, Clear Creek, East Fork San Carlos Creek, Larious Creek, Picacho Creek, San Benito River, and White Creek. NSO stipulations would apply to a larger area of public land surrounding these river segments than under Alternatives A, C, and D.

Given the application of stipulations that would apply to much of the open lease areas around eligible river segments, impacts from oil and gas development would be moderate under Alternative E. Long-term and permanent effects could still occur from oil and gas development within non-NSO lease areas (e.g., sedimentation, water contamination). Without stipulations in some of the open lease areas along eligible NWSRs, impacts under Alternative E would be more severe than Alternative B. Impacts may be less severe than Alternatives A, C, D, and F due to the greater acreage of Federal mineral estate subject to NSO stipulations under Alternative E.

In order to protect eligible NWSRs from impacts to their free-flowing conditions, water quality, or outstanding remarkable values, Mitigation Measure WSR-1 (Apply Lease Stipulations along Eligible NWSR Segments) in Appendix C is recommended for Alternative E. Additionally measures discussed in Sections 4.8 (Surface Water Resources), 4.10 (Biological Resources – Vegetation), 4.11 (Biological Resources – Wildlife Habitat), 4.12 (Biological Resources – Special Status Species), and 4.13 (Visual Resource Management) may be required and would help ensure resource protection for NWSRs.

Leases Subject to Settlement Agreement

There are no designated NWSR within the leases subject to settlement agreement. Under Alternative E, 13 of the 14 proposed leases in proximity to an eligible NWSR segment would be subject to NSO stipulations (see Table 2-3). Impacts to eligible portions of the river segments may occur over the long-term, but would be minor given the application of NSO stipulations that would provide protective management for these stream corridors. Impacts to eligible NWSRs would be less severe under Alternative E than Alternatives A (Subalternative 1) and C (due to their lack of stipulations in open lease areas), and more severe than Alternatives A (Subalternative 2), B and D (due to their larger acreage of areas closed to leasing).

4.21.8 Impacts of Alternative F

Under Alternative F, the following eligible NWSR segments would extend into Federal mineral estate open to oil and gas development: Cantua Creek, Clear Creek, East Fork San Carlos Creek, Larious Creek, Picacho Creek, San Benito River, and White Creek. The majority of the Federal mineral estate that may be open to leasing would be subject to CSU and NSO stipulations under Alternative F. Compared to Alternatives B through E, Alternative F has the most amount of Federal mineral estate lands that would be open to oil and gas development (with stipulations) around eligible river segments. Impacts may be slightly less severe than Alternative A due to the small increase in acreage closed to leasing near eligible NWSRs under Alternative F.

In order to protect eligible NWSRs from impacts to their free-flowing conditions, water quality, or outstanding remarkable values, Mitigation Measure WSR-1 (Apply Lease Stipulations Along Eligible NWSR Segments) in Appendix C is recommended for Alternative F. Additional measures discussed in Sections 4.8 (Surface Water Resources), 4.10 (Biological Resources – Vegetation), 4.11 (Biological Resources – Wildlife Habitat), 4.12 (Biological Resources – Special Status Species), and 4.13 (Visual Resource Management) may be required under Alternative F and would help ensure resource protection for NWSRs.

Leases Subject to Settlement Agreement

Under Alternative F, the 14 proposed leases would be open to oil and gas development and would not be subject to NSO stipulations. There are no designated NWSR within the leases subject to settlement agreement. Of the 11 eligible NWSR segments in the CCFO Planning Area, two river segments are in proximity to the non-NSO leases: East Fork San Carlos Creek segment extends into a non-NSO lease (Lease CACA 053834), and the Larious Creek segment is less than one mile south of the non-NSO leases (Leases CACA 053832 and 053835). Given the lack of stipulations that would apply to oil and gas development activities (e.g., sedimentation, water contamination) near eligible river segments, potential impacts could occur, similar to those discussed for the larger Planning Area. Although these eligible river segments were not recommended for inclusion in the NWSR System, these impacts would be long-term and could permanently degrade the rivers' outstanding remarkable value(s). Mitigation could be implemented similar to that discussed above for the larger Planning Area.

5. Cumulative Impacts

5.1 Introduction

The Council on Environmental Quality (CEQ) defines cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). The CEQ suggests cumulative impact analyses should focus on meaningful impacts, and not exhaustively analyze all possible cumulative impacts (CEQ, 1997). Therefore, the analysis in this RMPA and EIS focuses on past, present, and future actions that are anticipated to have environmental impacts similar to or impacting the same resources as the direct and indirect impacts identified for each of the alternatives. Cumulative projects include those actions that result in meaningful impacts to historically important resources, those with a potential for violating legal standards or laws, or other identified projects or actions in the geographic scope that relate to the identified issues. Cumulative impacts will be analyzed only for those resources that have identified direct or indirect impacts.

5.1.1 Geographic Scope

The geographic scope for which the list of cumulative projects was determined includes the 12 counties within the boundary of the CCFO Planning Area. The specific geographic scope for other resource areas may vary due to the different nature and extent of that resource. Each issue area analysis will consider the appropriate geographic scope due to the different nature and extent of the impacted resource area. The appropriate boundary depends on the accumulation characteristics of the effects being assessed (CEQ, 1997).

5.1.2 Timeframe

The timeframe of past, present, and reasonably foreseeable future projects was determined as follows:

- **Past and Present Oil and Gas Development.** Existing oil and gas exploration and development as defined in the CCFO Reasonably Foreseeable Development (RFD) Scenario (see Appendix B), which reflects the cumulative baseline or existing conditions; projects other than oil and gas are reflected in the existing environment in Chapter 3;
- **Reasonably Foreseeable Development Scenario.** An estimate of the level and type of future oil and gas activity in the CCFO Planning Area (see Appendix B);
- **Reasonably Foreseeable Future Action.** Includes oil, gas, and other relevant projects that have either: submitted permit applications, begun the environmental review process, been approved, or are under construction within the geographic scope. These projects were identified from a review of the 2015 RFD Scenario, the 2007 HFO RMP and Final EIS (BLM, 2007), and the California Department of Conservation's (DOC) Division of Oil, Gas, and Geothermal Resources (DOGGR) Analysis of Oil and Gas Well Stimulation Treatments (DOC, 2015).

5.1.3 Incomplete or Unavailable Information

Impacts are quantified where possible. Impacts are sometimes described using ranges of potential impacts or in qualitative terms. In the absence of quantitative data, impacts are described based on the professional judgment of the interdisciplinary team of technical specialists using the best available information. Impacts analysis based on incomplete or unavailable information is identified where applicable in this chapter.

5.1.4 Assumptions

Several general assumptions were made to facilitate the analysis of potential impacts. The assumptions listed below are common to all resources. Other assumptions specific to a particular resource are listed under that resource.

- Oil and gas production presents environmental, health and safety impacts that can be very different depending on the history of land use where it takes place.
- The degree of environmental impacts varies widely depending on whether it occurs in an existing oil and gas field versus a greenfield location, or if the surrounding area is urban, agricultural, or undeveloped.
- Local conditions also affect the environmental impacts of expanded production, such as the depth and quality of the local groundwater, availability of surface water, local air quality, distance to human population centers, and the proximity of sensitive species and habitats.

5.1.5 Incorporation by Reference

The BLM's analysis of cumulative effects in this Proposed RMPA/Final EIS is based primarily on the RFD scenario (App. B), and the CCST report *Advanced Well Stimulation Technologies in California* that is described in section 4.1.5 of this Proposed RMPA/Final EIS. The report identifies the limits and constraints of the analysis, which are summarized below. Nonetheless, the information in the CCST study is relevant to evaluating the incremental impacts to the environment of leasing and development of federal minerals in the Planning Area, and allows BLM to make a reasoned choice among the range of alternatives considered in the Proposed RMPA/Final EIS.

The constraints of the CCST report include areas of uncertainty within the assessment and other incomplete or unavailable information that affect BLM's evaluation of reasonably foreseeable effects on the human environment from leasing and development of the Federal mineral estate administered by the Central Coast Field Office. In particular, CCST was unable to quantify risks to public health, or increased seismicity, from implementation of enhanced stimulation techniques because reliable data cannot be obtained due to technical and budgetary constraints. Therefore, BLM's evaluation of such impacts is based upon theoretical approaches or research methods discussed in the CCST study and this Proposed RMPA/Final EIS.

The CCST report carefully assessed the direct environmental, climate, and public health impacts of advanced well stimulation techniques within the limits of data availability. The study explains there is a general lack of monitoring [or data available] to make inferences regarding the effects of well stimulation techniques in California, and all that can be done is to review and summarize what has been observed in other states or the published literature. This information should be taken as background material, which can direct further monitoring and observation in California.

For the purposes of analyzing risk to public health and/or induced seismicity, BLM shall incorporate by reference the definition of "reasonably foreseeable" from 40 CFR 1502.22(b)(4), which "includes impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason."

Environmental review documents associated with the cumulative projects listed in Table 5-1 and Table 5-2 are incorporated by reference into this impact analysis, as feasible. Nonetheless, many of the projects listed are in varying stages of development so details are incomplete or unavailable regarding the final impacts on resources in the Planning Area.

5.2 Past, Present, and Reasonably Foreseeable Future Actions

5.2.1 Past and Present Oil and Gas Exploration and Development

As of 2018, there are 127 authorized oil and gas leases on Federal mineral estate within the CCFO Planning Area covering an estimated 41,360 acres. Approximately eighty (80) producing/active oil and gas wells are located on Federal mineral estate within the CCFO Planning Area (CCST, 2015).

As described in the 2015 RFD Scenario, recent well drilling activity has not been evenly distributed across the CCFO Planning Area. Of the 12 counties in the CCFO Planning Area, five have had some recent levels of new well activity. However, existing wells are located on BLM-administered land only in the following counties: Contra Costa, Fresno, Monterey, San Benito, and Santa Cruz. No wells are located on BLM-administered land in Alameda, Merced, San Francisco, San Joaquin, San Mateo, Santa Clara, or Stanislaus Counties. In general, most of the new well activity in the counties covered by CCFO Planning Area occurs in Fresno County and in Monterey County (CCST, 2015).

The history of activity for oil and gas exploration and development on Federal lands within the planning area is minimal compared to private minerals. The most productive oil and gas fields in the CCFO Planning Area, in order of cumulative past production, include the following:

- Coalinga and Coalinga East Extension (Fresno County);
- San Ardo (Monterey);
- Lynch Canyon (Monterey);
- Jacalitos (Fresno);
- Kettleman North Dome (Fresno); and
- Hollister-Sargent (San Benito/Santa Clara).

In the last decade, nearly all well development occurred in the Coalinga, San Ardo, Lynch Canyon, and Jacalitos fields. Recent activity indicates that an annual average rate of between 140 and 210 wells per year have had first production or injection since 2002 in the region. Assuming that the development trend in this region is likely to continue for the next 15 to 20 years, up to 3,150 wells could be initiated over the planning period with over 99 percent of these wells located within the Coalinga, San Ardo, Lynch Canyon, and Jacalitos fields.

New oil and gas activity in the CCFO Planning Area has involved only limited levels of well stimulation by hydraulic fracturing. In the Fresno County portion of the CCFO Planning Area, which has the highest level of well stimulation, 4 percent of recently producing wells indicate any record of previous hydraulic fracturing (see Appendix B, RFD Scenario). Previous research results regarding the occurrence and geographic distribution of hydraulic fracturing operations in California in wells that commenced production or injection in 2002 through late 2013 had considerable uncertainty in Monterey, San Luis Obispo, Santa Barbara, and Santa Clara Counties due to unavailable well record scans. Because the Bureau of Land Management (BLM) manages land in oil productive sedimentary basins in all of these counties except Santa Clara, it requested the California Division of Oil, Gas and Geothermal Resources (DOGGR) scan the remaining records so that uncertainty regarding the historic use of hydraulic fracturing in these counties could be reduced. DOGGR subsequently provided scans for almost all the remaining well records within the study frame. Analysis of these records indicates the Cuyama, Hollister-Sargent, Salinas, Santa Maria, and Santa Barbara-Ventura basins had the lowest proportion of wells fractured of oil basins in California, and either no wells were fractured in each basin or the proportion of wells fractured declined toward the end of the study period. Three exploration wells south of the San Ardo field in the Salinas basin were fractured. They were fractured in a volume previously suggested to be source rock. The resulting oil production from each well was less than 100 barrels/day on average for each day of production within a calendar month. No subsequent hydraulic

fracturing occurred in the vicinity of these wells, suggesting the exploration results indicated hydraulic fracturing as applied was uneconomic (Jordan, 2018).

5.2.2 Reasonably Foreseeable Development Scenarios

The 2015 RFD Scenario was developed to estimate the level and type of future oil and gas activity in the CCFO Planning Area, and to provide a basis for assessing impacts, including cumulative impacts. This 2015 RFD Scenario is applicable to all alternative scenarios, because the alternatives considered in the RMPA/EIS consider which BLM-administered lands to open or close to leasing, which would not impact the assumptions.

Furthermore, the RFD Scenario identifies areas within the CCFO Planning Area that have been categorized as high, moderate, and low to no oil and gas occurrence potential, as summarized below and shown in Figure 5-1. Based on further analysis of the geology of the area and updated information, the areas of oil and gas occurrence potential have been modified from the 2007 HFO RFD Scenario for Oil and Gas. For a more detailed discussion of the oil and gas occurrence potential and the differences from the 2007 HFO RFD Scenario for Oil and Gas, see Appendix B.

High Oil and Gas Occurrence Potential

As illustrated in Figure 5-1, high oil and gas occurrence potential is located in southern San Benito County, southeastern Monterey County and western Fresno County. This area is part of the San Joaquin Basin and the Salinas Basin. The San Joaquin Basin has 8 oil fields that produce from Miocene and Pliocene marine sedimentary rocks. The Coalinga Field, located in western Fresno County, is the most productive field in the CCFO Planning Area and is currently the eighth largest oil and gas field in California. The entire San Joaquin Basin in the CCFO Planning Area is underlain by oil and gas plays, except for a 9-by-4-mile strip in the far northwest corner of the basin, just west of Westley.

Moderate Oil and Gas Occurrence Potential

The Sacramento Basin in the northeastern portion of the Planning Area has moderate oil and gas occurrence potential. There are 12 productive oil and gas fields and three abandoned fields in this area.

The La Honda Play is located within the northwestern area of the CCFO Planning Area. Four oil fields have been developed within this play. In 1983, there were estimated reserves of 1.7 million barrels of oil equivalents (MMBOE). According to the CCST 2015 study, the last systematic assessment of the Central Coastal basins resource potential was published by the USGS in 1995 (Gautier et al., 1995 in CCST, 2015). At that time the mean undiscovered petroleum resource was estimated to be about 78 million m^3 (490 million barrels) of oil, 4.2 billion m^3 (150 billion scf) of associated and dissolved gas, and about 1.6 million m^3 (10 million barrels) of NGL, which is a considerable volume of petroleum (Gautier et al.,1998 in CCST, 2105). Of these amounts, well over half of the undiscovered resource was estimated to be the two proven petroleum basins: La Honda, with about 8.3 million m^3 (52.4 million barrels) of oil and 0.44 billion m^3 (15.7 scf) gas (http://certmapper.cr.usgs.gov/data/noga95/prov11/tabular/pr1104.pdf), and Salinas, with 36 million m^3 oil (223.6 million barrels) of oil and 1.3 billion m^3 (44.7 billion scf) of associated and dissolved gas (http://certmapper.cr.usgs.gov/data/noga95/prov11/tabular/pr1106.pdf). The remaining basins were estimated to contain small, widely distributed oil and gas accumulations. Within the large area of the Central Coastal basins, the Salinas Basin, in particular, has significant potential for undiscovered conventional petroleum accumulations and for further development of heavy oil within the giant San Ardo field. The existence of the giant San Ardo oil field also demonstrates the presence of active and effective Monterey-equivalent petroleum source rocks deep in the basin. Therefore, a source-rock system "shale oil" play with significant recoverable resources is considered a real possibility in the Salinas Basin (CCST, 2015).

Low to No Oil and Gas Occurrence Potential

Within the CCFO Planning Area, the areas of low or no oil and gas occurrence potential are areas that are underlain dominantly by granitic, volcanic, metamorphic, and ophiolitic series rocks, as well as rocks of the Franciscan Formation. These areas of low or no oil and gas occurrence potential are shown on Figure 5-1.

5.2.3 Reasonably Foreseeable Future Actions

Oil and Gas Projects

Table 5-1 lists future oil and gas exploration and development projects that have been identified within the geographic scope. Table 5-1 does not include estimates for the total number of oil and gas wells that are expected to be developed on private mineral estate because they are considered part of the environmental baseline for energy development in the Planning Area, as described in the RFD (Appendix B). Nonetheless, the average number of wells drilled on private minerals, and the associated impacts, are summarized below for consideration of cumulative effects of the range of alternatives in BLM's Proposed RMPA.

Table 5-1. Cumulative Oil and Gas Projects

Project Name	Description	Location	Status
Phillips 66 Propane Recovery Project	Modification of 495-acre refinery to recover butane and propane from refinery fuel gas	Rodeo area, Contra Costa County	Operational, modification approved but EIR was sued and County is required to correct specified inadequacies.

Sources: DOC, 2015; Coon, 2018.

The BLM's RFD scenario for oil and gas estimates a total of 3,150 wells on private mineral estate in the Planning Area would be authorized by non-federal entities over a period of 15-20 years, at an average of approximately 150 wells/year (Appendix B, Table 4). Assuming the development trends in the region continue, over 99 percent of these wells would be in the Coalinga, San Ardo, Lynch Canyon, and Jacalitos fields. While some exploration could occur outside of areas with high oil and gas occurrence potential, the associated disturbance would be short term because it's unlikely those wells would be productive.

The RFD, Table 8, also provides assumptions about the amount of surface disturbance associated with typical oil and gas exploration or development activities. Since most or all of the new wells on private mineral estate are expected to occur in existing fields, the assumptions associated with the size of new well pads, miles of new roads, or new facilities, are based on the more conservative units of surface disturbance provided in Table 8. For example, a typical new well pad is approximately one acre upon completion and new facilities are incorporated into the 1-acre site plan. There are extensive road systems in the Coalinga, San Ardo, Lynch Canyon, and Jacalitos fields, so new road building should be limited to improvements for ingress and egress to oil and gas development sites less than 0.5 miles from an existing road (App. B, 5.2).

As a result, a conservative estimate for surface disturbance from non-federal oil and gas development activities for the next 15-20 years within the Planning Area is approximately 3.4 acres/well inside existing fields and 5.4 acres/exploratory well. Assuming the development trends in the region continue, there could be 170 acres of surface disturbance outside of existing fields, and more than 10,600 acres of surface disturbance inside existing fields, authorized by non-federal entities over the next 15-20 years.

Other Applicable Cumulative Projects

Other major projects producing related or cumulative effects, including large surface area disturbance, noise, air pollution, greenhouse gas emissions, water pollution, the use of hazardous materials, and/or high water usage, are included in Table 5-2. These projects include development projects, resource extraction

activities, power generating facilities, renewable and non-renewable energy projects, large-scale infrastructure, flood control, and road improvement projects. The estimated average annual water use for irrigated cropland in California from 1998 to 2005 is summarized in Table 5-3. California experienced a drought from 2008 to 2016, so the period that proceeded the drought was chosen as the baseline for California's water use to irrigate croplands. The estimates are provided for each hydrologic region within the CCFO Planning Area, as defined by the California Department of Water Resources (DWR) and the State Water Resources Control Board (SWRCB). The time frame considered in the EIS is a 15- to 20-year horizon. Water use for agricultural production has gained efficiencies as a result of the prolonged drought increasing investments in technology and water conservation practices in California. The cumulative analysis conservatively considers that future agricultural water use within this time frame will not vary substantially from that revealed in the data in the table below.

Table 5-2. Other Applicable Cumulative Projects

Project Name	Description	Location	Status
Alameda County			
Next Era Wind Repowering Project	135.7 MW; 8,950-acre wind repowering project	North and south of I-580, southeastern Contra Costa county and northeastern Alameda County	Approved November 2015, online
SMP 30 Sunol Quarry Project (Expansion)	Quarry expansion project	Sunol, Alameda County	Approved
Summit Wind Project Repower (Altamont Winds)	95 MW; 7,650-acre wind project	South of I-580, northeastern Alameda County	Under construction
Contra Costa County			
No applicable other cumulative projects have been identified in Contra Costa County.			
Fresno County			
Austin Quarry	671-acre aggregate mining project	8 miles north of Fresno, Fresno County	Approved
Carmelita Aggregate Mine	900-acre aggregate mine	East of Sanger, Fresno County	Approved
Jesse Morrow Mountain Mine and Reclamation Project	824-acre aggregate mining, processing, and distribution facility	East of Sanger, Fresno County	Environmental review
Riverbend Sand and Gravel Project	619-acre aggregate mine	Southeast of Sanger, Fresno County	Approved
Tranquility Solar Generating Station	1,900-acre; 200 MW solar generating facility	Southwest of Tranquility, Fresno County	Operational
Little Bear Solar Project	1,288-acre; up to 180-MW solar generating facility	Western Fresno County, west of SR-33, 2.5 miles south of Mendota	Environmental review (Notice of Preparation)
Fifth Standard Solar Project	1,593 acres; up to 180 MW solar facility with storage	Western Fresno County, west of South Lassen Avenue	Environmental review (Notice of Preparation)
Merced County			
Don Chapin Concrete Batch Plant Project	26.9-acre project for the delivery and storage of materials, concrete mixing	Volta, west-central Merced County	Environmental Review
Leo/Vega Solar Project	1,009-acre; 150 MW solar PV power plant	Southwestern Merced County adjacent to I-5	20 MW operational
Snellings Tailings Project	409-acre, dredge tailings removal project	Snelling, northeastern Merced County	Approved
Sumpter Project Mine and Reclamation Project	28-acre sand removal project	West of Atwater, Merced County	Approved

Table 5-2. Other Applicable Cumulative Projects

Project Name	Description	Location	Status
Wright Solar Park	1,600-acre; 200 MW solar PV power plant	Western Merced County	In development
Monterey County			
Stonewall Quarry	33-year extension of permit for 53-acre surface mine	2 miles northeast of Soledad, Monterey County	Active, Environmental review for extension
California Flats Solar	280 MW PV solar project	4 miles southeast of Parkfield, Monterey County	Under construction
San Benito County			
Solargen Panoche Valley Solar Project	1,300 acres; 130 MW solar facility	East-central San Benito County	Under construction
San Joaquin County			
Hendrick Pit	Aggregate mine	San Joaquin County	Approved
KRC Aggregates Mine Expansion Project	1,059-acre expansion to existing 1,048-acre quarry	Between Clements and Wallace, San Joaquin County	Approved
Tracy Lakes Quarry Excavation Project	Aggregate mine	6.5 miles northwest of Lodi, San Joaquin County	Approved
East and West Vernalis	Aggregate mines	Vernalis, San Joaquin County	Approved
Vernalis	Aggregate mine	Vernalis, San Joaquin County	Approved
Stanislaus County			
Riddle Surface Mine	436-acre aggregate mine	3 miles northwest of Newman, Stanislaus County	Environmental Review

Source: DOC, 2015; Power Engineering, 2017; SF BOS 2013; Renewables Now, No date; Smith, 2016; Benjamin, 2015; RE, No date; Fresno County, 2017a and 2017b; Thomas Law Group, 2018; frontier renewables, No date; County of Monterey, no date; S&P Global, 2017; Chadwell, 2018.

Table 5-3. Average Annual Water Use for Irrigated Cropland 1998-2005

Hydrologic Region	Irrigated Crop Area[1] (thousands of acres)	Quantity of Applied Water[2] (million acre-feet)
San Francisco Bay	81	0.1
Central Coast	430	1.0
San Joaquin River	1,900	7.0
Tulare Lake	3,000	10.0

1 - The total amount of land irrigated for the purpose of growing a crop. Some land is cropped more than once during the year, so irrigated crop acreage exceeds irrigated land area

2 - Gross water use, includes water available for reuse

Source: DOC, 2015.

5.3 Cumulative Impacts

5.3.1 Energy and Minerals

Cumulative impacts to energy and minerals would occur if impacts of the oil and gas development under the RFD Scenario combine with other projects or actions within the Planning Area to reduce access to or the development of energy or mineral resources. Section 3.2.2 of the EIS describes the regional setting subject to future oil and gas development activities that may be authorized by non-federal entities as 35 oil and gas fields in the Planning Area. The actual productive areas total about 195,300 acres.

The geographic scope of cumulative effects analysis for energy and minerals is limited to areas within 0.5-mile of the existing oil and gas fields. While some exploration could occur outside of areas with high oil and gas occurrence potential, the associated disturbance would be short term because it's unlikely those wells would be productive.

The BLM management decisions regarding energy are unlikely to combine with the list of cumulative projects to reduce the development of oil or gas in the CCFO Planning Area. This is because the cumulative projects listed n Table 5-1 and 5-2 are more than 0.5-mile from where over 99 percent of the new wells are expected to be developed. While some exploration could occur outside of areas with high oil and gas occurrence potential, the associated disturbance would be short term because it's unlikely those wells would be productive. Also, Counties take into consideration the need for energy during their General Plan and set aside areas for such development. Prior to approval of any of the projects listed in Table 5-2, the Counties would analyze whether the projects would restrict use of other resources such as energy and would reduce any loss of access if feasible and applicable.

As noted in Section 4.2, development of up to 37 wells in the CCFO Planning Area on up to 206 acres of land would result in only a minor loss of access to mineral resources. The majority of projects listed in Table 5-2 are mines and, in combination with the RMPA/EIS alternatives would not result in a cumulative loss of mineral resources, because they don't occur on the same BLM-administered lands. While the renewable projects listed in Table 5-2 would require use of a large amount of acreage, each County would analyze whether the renewable projects would restrict other uses of the lands and mitigate for such loss.

The BLM's RFD scenario for oil and gas estimates a total of 3,150 wells on private mineral estate in the Planning Area would be authorized by non-federal entities over a period of 15-20 years, at an average of approximately 150 wells/year. Assuming the development trends in the region continue, there could be 170 acres of surface disturbance outside of existing fields, and more than 10,600 acres of surface disturbance inside existing fields, authorized by non-federal entities over the next 15-20 years.

Consequently, cumulative impacts to minerals within the CCFO Planning Area from Alternatives A, C, D, E, and F would be negligible because the change from 206 acres of disturbance on Federal mineral estate would be hard to measure when combined with 10,600 acres of disturbance from a total of 3,150 wells on private mineral estate in the Planning Area that could be authorized by non-federal entities over the next 15-20 years. Alternative B would place the most restrictions on where energy could be developed in the CCFO Planning Area on Federal mineral estate. This would result in a minor contribution to cumulative restrictions to energy development reducing the future energy development potential in this area.

5.3.2 Geology

Cumulative impacts to geologic resources would occur if oil and gas development on Federal mineral estate combines with other projects or actions within the Planning Area to increase geologic hazards. Section 3.2.2 of the EIS describes the regional setting subject to future oil and gas development activities that may be authorized by non-federal entities as 35 oil and gas fields in the Planning Area. The actual productive areas total about 195,300 acres. The geographic area considered for cumulative effects related to geologic hazards is within a 0.5-mile radius of open areas for all alternatives. This is because impacts resulting from construction activities are localized in nature and are unlikely to extend beyond the actual oil and gas occurrence boundaries.

The current use of well stimulation technologies (including hydraulic fracturing) in California is not considered to pose a significant seismic hazard (CCST, 2014). Induced seismicity has been linked to the injection of large volumes of wastewater into deep disposal wells in the eastern and central United States (CCST, 2014). Currently, the volume of wastewater injected underground in California is small compared to other states, and the depth of the injection wells is comparatively shallow (CCST, 2014).

The current risk of induced seismicity from wastewater disposal in California is small; however, with an increase in well stimulation treatments and an increase in wastewater injection (including from future cumulative oil and gas related projects), the risk of induced seismicity may increase (CCST, 2014). Further studies of the relationship, if any, between wastewater injection, seismicity and faulting in California will be needed to establish this with confidence and to provide a better idea of incremental hazard levels due to induced seismicity (CCST, 2015).

An oil and gas development would expose people and/or structures to geologic hazards, and a cumulative effect could occur if another project within a 0.5-mile radius would also expose people and/or structures to geologic hazards. The BLM's RFD scenario for oil and gas estimates a total of 3,150 wells on private mineral estate in the Planning Area would be authorized by non-federal entities over a period of 15-20 years, at an average of approximately 150 wells/year. While some exploration could occur outside of areas with high oil and gas occurrence potential, most of the new wells would be within existing oil and gas fields that are known to be productive.

Assuming the development trends in the region continue, cumulative impacts from Alternatives A, B, C, D, E, and F would be negligible because the risk of exposing people and/or structures to geologic hazards from drilling up to 37 new wells on Federal mineral estate would be hard to measure when combined with a total of 3,150 wells drilled on private mineral estate in the Planning Area that could be authorized by non-federal entities over the next 15-20 years.

5.3.3 Hazardous Materials and Public Safety

The geographic scope for cumulative analysis for hazardous materials and public safety is generally within the oil and gas project boundaries and along the access routes or pipeline routes. This is where hazardous materials and public safety effects are generally localized. Because oil and gas projects could be built anywhere within the open areas, the geographic scope for cumulative impact analysis is anywhere within the open areas and access routes for the entire CCFO Planning Area and along the pipelines.

Many of the effects of oil and gas development analyzed in Section 4.4 would only have the potential to contribute to a cumulative effect with the oil and gas development and other projects authorized by non-federal entities. These include impacts such as public exposure to hazards of oil and gas operations, well blowouts, subsurface contamination, irrigation with produced water, pressurized gas releases, and transportation of crude oil and gas by pipeline.

The BLM's RFD scenario for oil and gas estimates a total of 3,150 wells on private mineral estate in the Planning Area would be authorized by non-federal entities over a period of 15-20 years, at an average of approximately 150 wells/year. While some exploration could occur outside of areas with high oil and gas occurrence potential, most of the new wells would be within existing oil and gas fields that are known to be productive.

All phases of oil and gas development would involve the transport, use, storage, and disposal of hazardous materials. The projects listed in Tables 5-1 and 5-2 use similar hazardous materials such as fuels, lubricating oils, hydraulic fluids, glycol-based coolants, lead-acid batteries, solvents, paints, cleaning agents, coatings, and herbicides. Solar facilities could also involve the use of the toxic elemental metal cadmium and dielectric fluids.

Construction, operations, and decommission activities of the solar projects listed in Table 5-2 would involve movement of large amounts of soil materials. Valley Fever is spread through the air and if soil containing the Valley Fever fungus is disturbed by construction, natural disasters, or wind, the fungal spores can be released into the air.

Renewable energy sites may have existing contamination that could pose a risk to workers and the environment during site characterization, construction, operations, and decommissioning. Potential hazardous

material impacts from renewable projects listed in Table 5-2 are increased risks of fires, human health impacts, and environmental contamination. This could lead to environmental impacts related to biological resources, surface water, groundwater, air quality, agriculture and grazing, and recreation. However, cumulative impacts resulting from hazardous materials are not likely to occur because oil and gas development anticipated by the 2015 RFD Scenario is not near the projects listed in Tables 5-1 and 5-2.

Assuming the development trends in the region continue, cumulative impacts from Alternatives A, B, C, D, E, and F would be negligible because the increased risk of hazardous materials releases and exposures from drilling up to 37 new wells on Federal mineral estate would be hard to measure when combined with a total of 3,150 wells drilled on private mineral estate in the Planning Area that could be authorized by non-federal entities over the next 15-20 years.

5.3.4 Air Quality and Atmospheric Conditions

Cumulative impacts to air quality would result from impacts of the oil and gas development under the 2015 RFD Scenario that combine with impacts of other projects or actions within the CCFO Planning Area. The geographic scope would include the areas of most likely development, which are either in the North Central Coast air basin or in the San Joaquin Valley air basin, including areas impacted by cumulative projects within or near the portions of these air basins that are in the CCFO Planning Area.

Based on data posted by CARB, the BLM's Air Quality Technical Support Document (Appendix K, Table 3-1) presents baseline emissions for oil and gas development within the CCFO Planning Area. Table 3-1 focuses on two air basins: North Central Coast (San Benito County and Monterey County) and the Fresno County portion of the San Joaquin Valley air basin because emissions would most likely occur within the jurisdiction of either the Monterey Bay Unified Air Pollution Control District (MBUAPCD) or San Joaquin Valley Air Pollution Control District (SJVAPCD), depending on the location of the leases.

In Chapter 4, Table 4.5-1 quantifies the maximum anticipated levels of construction-phase emissions for the development of three wells (annually) based on the RFD scenario. Table 4.5-2 also quantifies the emissions from long-term operations and maintenance from full buildout of the RFD scenario. The BLM's Air Quality Technical Support Document (Appendix K, Table 3-2) also presents projected emissions for oil and gas production — operation & maintenance — if all 37 wells forecast under the RFD scenario were developed.

The BLM's projected emissions from the 37 wells represent a small fraction of the standing emissions attributed to oil and gas development/production within the CCFO Planning Area. These proportions for ozone precursors range from 3.5% for Reactive Organic Gases (ROG) to 12% for NOx in the Fresno County portion of the San Joaquin Valley air basin. The proportions for the ozone precursors are 1.2% of ROG and 6.2% for NOx in Monterey County. Emission inventories for the standing base of oil and gas sources do not include dust from surface disturbance, but Table 3-2 in Appendix K indicates that surface disturbance is a primary cause of PM10 and PM2.5. These added emissions represent a small part of the standing base. With emission *offsets* (Emission Reduction Credits) that would be required to permit a new stationary source within nonattainment areas, the cumulative effect of BLM's RFD scenario on air quality in these basins would be minor.

The BLM's RFD scenario for oil and gas estimates a total of 3,150 wells on private mineral estate in the Planning Area would be authorized by non-federal entities over a period of 15-20 years, at an average of approximately 150 wells/year. While some exploration could occur outside of areas with high oil and gas occurrence potential, most of the new wells would be within existing oil and gas fields that are known to be productive.

Assuming the development trends in the region continue, cumulative impacts from Alternatives A, B, C, D, E, and F would be minor because the increased emissions of criteria pollutants from drilling up to 37

new wells on Federal mineral estate is slight, but detectable, when combined with a total of 3,150 wells drilled on private mineral estate in the Planning Area that could be authorized by non-federal entities over the next 15-20 years.

As discussed in Section 4.5, new sources of air pollution, including those associated with oil and gas development and other cumulative projects, would require further project- and site-specific analysis by the local air quality management district and for activity on public land, by the BLM. Applicable BMPs, stipulations, and other COAs would be identified and imposed as necessary. Each application for new oil and gas activity would require an assessment of ambient air quality conditions (baseline or existing), National Ambient Air Quality Standards, criteria pollutant nonattainment conditions, and potential air quality impacts of the activity (including cumulative and indirect impacts). This would disclose the potential impacts from temporary or cumulative degradation of air quality to the affected air basin. All cumulative projects would be expected to undergo environmental permitting and would be likely to incorporate mitigation to reduce short-term emissions during construction and long-term emissions for ongoing operations and maintenance. Cumulative project mitigation would likely be similar to mitigation identified in Section 4.5 for oil and gas activity, including measures to control dust, control emissions from equipment, use best available emissions controls on stationary sources, and possibly to offset emission sources.

5.3.5 Climate Change/Greenhouse Gas Emissions

Globally, greenhouse gas (GHG) emissions contribute, by their nature, on a cumulative basis to the adverse environmental impacts of global climate change. Because the primary environmental effect of GHG emissions would be to exacerbate global climate change and the numerous side-effects on the environment and humans, the area of influence for GHG impacts is global.

The BLM's Air Quality Technical Support Document (Appendix K, Table 3-1) presents baseline emissions for oil and gas development within the CCFO Planning Area. The BLM's projected emissions from the development of up to 37 new wells represent a small fraction of the standing emissions attributed to oil and gas development/production within the CCFO Planning Area.

As noted in Section 4.6, the alternatives would result in directly emitted GHG and indirect emissions from end-users of the fuels. Tables 4.6-1 and 4.6-2 in Section 4.6.2 estimate that development and production phase GHG emissions for a full buildout of the 2015 RFD scenario on Federal mineral estate would result in 19,084 metric tons of carbon dioxide equivalent ($MTCO_2e$) annually, which is 0.004 percent of the approximately 429 million metric tons of CO_2-equivalent ($MMTCO_2e$) that California emitted statewide in 2016 or 0.1 percent of the roughly 18 $MMTCO_2e$ emitted in California for oil and gas production and processing activities before refining or end-use of the fuels (ARB, 2018).

Table 4.6-3 in Section 4.6.2 provides a rough estimate of potential indirect emissions as 141,062 MTCO2e, 0.03 percent of the approximately 429 $MMTCO_2e$. Table 4.6-3 shows that the sum of production plus transport, with the additional GHG resulting from the eventual combustion or end-use of the crude oil (including CO_2, CH_4, and N_2O), under the RFD Scenario would be 195,285 $MTCO_2e$ per year. This quantity represents about 0.015 percent of the 1,332 $MMTCO_2e$ national GHG emissions from the extraction and end-use combustion of fossil fuels produced on Federal lands (Merrill, 2018).

The BLM's RFD scenario for oil and gas estimates a total of 3,150 wells on private mineral estate in the Planning Area would be authorized by non-federal entities over a period of 15-20 years, at an average of approximately 150 wells/year. The cumulative impacts to climate change from Alternatives A, B, C, D, E, and F would be minor because the increased emissions of GHG from drilling up to 37 new wells on Federal mineral estate is slight, but detectable, when combined with a total of 3,150 wells drilled on private mineral estate in the Planning Area that could be authorized by non-federal entities over the next 15-20 years.

All projects listed in Tables 5-1 and 5-2 would result in direct emissions of GHG over the lifetime of the projects. Some projects, such as the wind and solar projects, would also produce electricity in a manner that avoids the GHG emissions normally associated with power plants over the lifetime of the projects. While each project's GHG emissions would be subject to State climate change programs including California's Cap-and-Trade Program and/or local air quality regulations, any increases in GHG emissions that occur in the CCFO Planning Area would contribute to cumulative increases in global GHG emissions. As noted in Section 3.6, how climate change may impact California is described in the 2009 Biennial Report of the California Climate Action Team (CAT, 2009) and Our Changing Climate 2012 from the California Climate Change Center (CEC, 2012). The effects anticipated in the Central Valley provide an illustration of the potential changes: the number of days conducive to ozone formation in the San Joaquin Valley may rise by 75 to 85 percent by the end of the century; and sea-level rise may place additional pressure on the levee systems and increase the intensity of saltwater intrusion into coastal groundwater resources, leading to increased flooding and decreased freshwater availability (CAT, 2006; CAT, 2009). The California Climate Change Center notes that the agricultural resources of the Salinas Valley are particularly vulnerable (CEC, 2012). Cumulative emissions would contribute to these effects.

5.3.6 Groundwater Resources

The cumulative impact analysis for groundwater resources considers the estimation of future oil and gas well development on Federal mineral estate in the 2015 RFD Scenario, the future oil and gas projects summarized in Table 5-1, and the other applicable cumulative projects summarized in Table 5-2.

If the current development trend continues, 3,150 wells could be initiated over the planning period within the CCFO Planning Area and over 99 percent of these would be within the Coalinga, San Ardo, Lynch Canyon, and Jacalitos oil and gas fields (Section 5.2.1). The RFD Scenario assumes that 32 to 37 wells will be developed in the next 15 to 20 years on Federal mineral estate within the CCFO Planning Area, regardless of the chosen alternative. Therefore, only 1 percent of the wells projected for the CCFO Planning Area during the planning period might be on Federal mineral estate. As stated in Section 5.2.1, nearly all well development in the last decade occurred in four oil and gas fields: Coalinga, San Ardo, Lynch Canyon, and Jacalitos. If the 32 development wells expected to be drilled within existing oil and gas fields are within these four oil and gas fields, then two groundwater subbasins — Westside subbasin (CDWR basin number 5-22.09), which intersects a small portion of the Coalinga field, and Paso Robles Area subbasin (3-4.06), which intersects a portion of the San Ardo field — may be particularly vulnerable to impacts (see Figure 7.3-3). Both of these subbasins are critically overdrafted basins (CDWR, 2016) and have been assigned a CASGEM high-priority ranking for the CASGEM basin prioritization program (CDWR, 2014). However, as stated in Section 4.7.2, BLM regulations, the DOGGR regulations, and mitigation measures provided in the DOGGR Final EIR collectively serve to reduce any potential impacts to the quantity or quality of usable groundwater.

In addition to the well development projected in the RFD Scenario, there are other future projects in the CCFO Planning Area. There is one cumulative future oil and gas exploration and development projects within the CCFO Planning Area (Table 5-1). The Phillips 66 Propane Recovery Project in Contra Costa County involves a modification to the existing refinery to recover butane and propane from refinery fuel gas. The Phillips 66 Refinery, however, is in northwestern Contra Costa County and is not located on Federal mineral estate. Other applicable cumulative projects in the CCFO Planning Area include mostly mining projects, with some alternative energy projects (solar and wind), quarry projects, a dredge tailings removal project, and a concrete plant (Table 5-2). Based on the nature of the cumulative projects, a cumulative impact on groundwater quality is not expected. But, because the amount of water necessary for each of the cumulative projects is not known, there is the potential that these projects could have a cumulative impact on groundwater quantity. In addition to these cumulative projects, future municipal and industrial growth, along with the ongoing water demands of existing agriculture, will add additional pressure to the increasing water demand.

As stated in Section 4.7, water quantity impacts depend on local conditions, and therefore, require a site-specific analysis (CCST, 2014). The volumes of water are often less important than the rates and timing of the withdrawals. There is uncertainty associated with the amount of water needed for future well stimulation treatments, the amount of water needed for future cumulative projects, and the amount of water available due to the recent extreme drought in California. The average water use for hydraulic fracturing in California is small (140,000 gallons per well or 0.4 AF/well) when compared to the overall water use in most of the California basins. In addition, the average water use per well is similar to the average annual water use of one household in California (153,000 gallons) (CCST, 2015). Nonetheless, recognizing the pressure placed on scarce water resources during the ongoing California drought, it is reasonable to assume that any increase in groundwater use could result in a minor cumulative adverse effect on groundwater quantity, especially in a basin already subject to overdraft, because the increase in competition for water availability would be slight, but detectable, when combined with a total of 3,150 wells drilled on private mineral estate in the Planning Area that could be authorized by non-federal entities over the next 15-20 years.

5.3.7 Surface Water Resources

Cumulative impacts to surface water would occur if oil and gas development on Federal mineral estate combines with other projects or actions within the Planning Area to impact beneficial uses of surface waters. Section 3.2.2 of the EIS describes the regional setting subject to future oil and gas development activities that may be authorized by non-federal entities as 35 oil and gas fields in the Planning Area. The actual productive areas total about 195,300 acres. The geographic scope for cumulative effects related to surface waters includes resources within a 0.5-mile radius of existing oil and gas fields because the RFD anticipates most or all future development in the Coalinga, San Ardo, Lynch Canyon, and Jacalitos fields.

The BLM's RFD scenario for oil and gas estimates a total of 3,150 wells on private mineral estate in the Planning Area would be authorized by non-federal entities over a period of 15-20 years, at an average of approximately 150 wells/year. While some exploration could occur outside of areas with high oil and gas occurrence potential, most of the new wells would be within existing oil and gas fields that are known to be productive.

Assuming the development trends in the region continue, cumulative impacts from Alternatives A, B, C, D, E, and F would be negligible because the impacts to surface waters from drilling up to 37 new wells on Federal mineral estate would be hard to measure when combined with a total of 3,150 wells drilled on private mineral estate in the Planning Area that could be authorized by non-federal entities over the next 15-20 years.

Cumulative effects to surface water quality could occur if disturbed soils or spills or disposal of potentially harmful materials used during construction occurred during oil and gas drilling and combined with disturbed soils or spills from the cumulative projects listed in Tables 5-1 and 5-2. Most projects listed in Tables 5-1 and 5-2 are sufficiently far from the open areas for all alternatives that it is unlikely that any simultaneous spill would impact the same water feature and any cumulative effects would be expected to be minor and short-term.

Cumulative effects to flooding are expected to be minimal because all of the projects listed in Tables 5-1 and 5-2 are expected to have few new permanent structures or impervious surfaces. This combined with the effects of the oil and gas development would result in minor cumulative effects to flooding.

As noted in Section 5.3.6, Groundwater Resources, cumulative effects to water use and supply depends on local conditions, and therefore, require a site-specific analysis (CCST, 2014). There is uncertainty associated with the amount of water needed for future well stimulation treatments, the amount of water needed for future cumulative projects, and the amount of water available due to the recent extreme drought in California. Recognizing the pressure placed on scarce water resources during the ongoing California drought, it

is reasonable to assume that any increase in water use could result in a cumulative adverse effect on water use and supply.

5.3.8 Soil Resources

The geographic area considered for cumulative effects related to soils is within a 0.5-mile of existing oil and gas fields because the RFD anticipates most or all future development in the Coalinga, San Ardo, Lynch Canyon, and Jacalitos fields. This is because impacts resulting from erosion are localized in nature and are unlikely to extend beyond the actual project boundaries unless an extreme event results in substantial downstream erosion.

Section 3.2.2 of the EIS describes the regional setting subject to future oil and gas development activities that may be authorized by non-federal entities as 35 oil and gas fields in the Planning Area. The actual productive areas total about 195,300 acres.

The BLM's RFD scenario for oil and gas estimates a total of 3,150 wells on private mineral estate in the Planning Area would be authorized by non-federal entities over a period of 15-20 years, at an average of approximately 150 wells/year. While some exploration could occur outside of areas with high oil and gas occurrence potential, most of the new wells would be within existing oil and gas fields that are known to be productive.

Assuming the development trends in the region continue, there could be 170 acres of surface disturbance outside of existing fields, and more than 10,600 acres of surface disturbance inside existing fields, authorized by non-federal entities over the next 15-20 years. The BLM management decisions regarding energy are unlikely to combine with the list of cumulative projects listed in Table 5-1 and 5-2 to impact soils in the CCFO Planning Area because they are not located within 0.5-mile of existing oil and gas fields where most future oil and gas activity is expected to occur. The only cumulative project that is close enough to potential development in the open areas for each alternative is the Stonewall Quarry. While any disturbance to surface soils could expose soils to the effects of wind and water and result in erosion, the anticipated ground disturbance for the up to 37 wells, 206 acres, combined with the 53 acres of potential ground disturbance from the Quarry would have only a minor potential to result in a cumulative effect. Standard BMPs required for both the oil and gas development as well as standard BMPs required for mining activities would reduce the effects of any potential cumulative soil erosion such that the overall cumulative impact would be minor.

Consequently, cumulative impacts to soils within the CCFO Planning Area from Alternatives A, B, C, D, E, and F would be negligible because the change from 206 acres of disturbance on Federal mineral estate would be hard to measure when combined with 10,600 acres of surface disturbance from a total of 3,150 wells on private mineral estate in the Planning Area that could be authorized by non-federal entities over the next 15-20 years.

5.3.9 Biological Resources – Vegetation

The cumulative impact analysis for biological resources is bounded by the timeframe, geographic scope, and analytical assumptions. The timeframe is discussed in Section 5.1.2. The geographic scope for analysis of cumulative effects on biological resources is the Planning Area. The analytic assumptions are that other Federal and State agencies with a stake in the Planning Area will continue to implement their current plans as written. It is further assumed that private lands within the Planning Area would continue to exhibit the same overall spatial pattern and trends of vegetation, habitat, and disturbance over time as presently exists.

Biological resources are primarily subject to degradation from human activities, including surface disturbance. Historically, the CCFO Planning Area has been subject to human disturbances that have resulted from agriculture, grazing, development, and recreational use. These trends in disturbance are expected to continue accumulating a net loss of these resources.

Cumulatively, these historic trends of adverse impacts result from private, local, State, and Federal actions within the Planning Area. To counter these adverse impacts, agencies with a preservation or protection mandate, such as BLM, plan for and implement actions to mitigate these trends (e.g., habitat conservation plans and species recovery plans). The actions provided for by the BLM through this RMPA add to the protections of biological resources through the support, compliance with, and enhancement of these efforts. However, there is a limited amount of land within the Planning Area under BLM management.

Cumulative impacts directly relate to the management of the biological resources in the Planning Area. The RMP FEIS (BLM, 2006) discusses BLM management of livestock grazing, wildland fire and fuels management, recreation, and other activities, and provides an analysis of cumulative impacts of management actions. The RMP FEIS concludes that the RMP would result in generally moderate levels of cumulative impacts and localized, high-impact activities occurring as a result of BLM management actions are expected to be relatively minimal. Therefore, cumulative impacts are not expected to be extensive under the RMP (BLM, 2006).

Assuming the development trends in the region continue, cumulative impacts from Alternatives A, B, C, D, E, and F would be minor because the increased impacts to vegetation communities from up to 206 acres of surface disturbance on Federal mineral estate would be slight, but detectable when combined with up to 10,600 acres of surface disturbance from wells drilled on private mineral estate in the Planning Area that could be authorized by non-federal entities over the next 15-20 years.

Vegetation and Habitat Impacts

Section 4.10 describes potential impacts to native vegetation and habitat from oil and gas development in the Planning Area. Oil and gas development, as well as other current and probable future projects in the Planning Area (Section 5.2), would contribute to cumulative direct and indirect impacts to vegetation and habitat.

Oil and gas development in the Planning Area has the potential to result in short-term and temporary and long-term and permanent adverse impacts on biological resources that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. Site-specific analysis would be required to determine actual impacts.

Oil and gas development on BLM land and split estate would be mainly in existing well fields. New development in common vegetation communities that do not support special status species would result in minor impacts to vegetation and habitat. However, valuable native habitat is found within some existing oil and gas fields, where future effects of oil and gas development could contribute to cumulatively considerable impacts.

Site-specific analysis and implementation of lease stipulations, BMPs, SOPs, and additional mitigation as presented in Section 4.10 would reduce impacts and minimize the incremental contribution to cumulative effects from each oil and gas development lease.

Generally, the context and intensity of non-BLM activities are not anticipated to vary by alternative because these activities do not directly depend on BLM management actions and allowable uses set forth in the RMPA alternatives; however, oil and gas development will somewhat depend upon BLM management.

As discussed in the RMP FEIS (BLM, 2006), much of the BLM management in these alternatives is designed to protect and preserve biological resources. However, there is a very limited amount of land within the Planning Area under BLM management. Therefore, BLM management makes a relatively small contribution to cumulative effects, both adverse and beneficial, throughout the Planning Area.

Overall, each alternative would contribute incrementally to cumulative impacts. Most impacts would be avoided and minimized through implementation of lease stipulations, BMPs, and SOPs, and additional

mitigation as described in Section 4.10, and the net cumulative effect of oil and gas leasing on BLM-managed lands would be minor.

5.3.10 Biological Resources – Wildlife Habitat

Introductory information regarding the geographic scope and other assumptions for biological resources in Section 5.3.9 would also apply to Wildlife Habitat.

Section 4.11 describes potential impacts to wildlife and habitat from oil and gas development in the Planning Area. Oil and gas development, as well as other current and probable future projects in the Planning Area (Section 5.2), would contribute to cumulative direct and indirect impacts to wildlife and habitat.

Site-specific analysis and implementation of lease stipulations, BMPs, SOPs, and additional mitigation as presented in Section 4.11 would reduce impacts and minimize the incremental contribution to cumulative effects from each oil and gas development lease.

Assuming the development trends in the region continue, cumulative impacts from Alternatives A, B, C, D, E, and F would be minor because the increased impacts to wildlife habitat from up to 206 acres of surface disturbance on Federal mineral estate would be slight, but detectable when combined with up to 10,600 acres of surface disturbance from wells drilled on private mineral estate in the Planning Area that could be authorized by non-federal entities over the next 15-20 years.

5.3.11 Biological Resources – Special Status Species

Introductory information regarding the geographic scope and other assumptions for biological resources in Section 5.3.9 would also apply to Special Status Species.

Section 4.12 describes potential impacts to special status species from oil and gas development in the Planning Area. Oil and gas development, as well as other current and probable future projects in the Planning Area (Section 5.2), would contribute to cumulative impacts to special status species.

Oil and gas development on BLM land and split estate would be mainly in existing well fields. New development in common vegetation communities that generally do not support special status species would result in negligible or no impacts to special status species. However, valuable native habitat that may support special status species is found within some existing oil and gas fields, where future effects of oil and gas development could contribute to cumulatively considerable impacts.

Site-specific analysis and implementation of lease stipulations, BMPs, SOPs, and additional mitigation as presented in Section 4.12 would reduce impacts and minimize the incremental contribution to cumulative effects from each oil and gas development lease.

Assuming the development trends in the region continue, cumulative impacts from Alternatives A, B, C, D, E, and F would be minor because the increased impacts to wildlife habitat from up to 206 acres of surface disturbance on Federal mineral estate would be slight, but detectable when combined with up to 10,600 acres of surface disturbance from wells drilled on private mineral estate in the Planning Area that could be authorized by non-federal entities over the next 15-20 years.

5.3.12 Visual Resource Management

The geographic scope for cumulative visual impacts is limited to land areas within the viewshed of potential CCFO Planning Area oil and gas lease lands designated VRM Class I, II, and/or III. Lands visible from potential CCFO Planning Area oil and gas lease lands designated VRM Class IV need not be considered because the VRM Class IV management objective allows for a high level of visual change. As a result, cumulative actions in combination with potential CCFO Planning Area oil and gas leasing would not be expected to result in inconsistencies with the VRM Class IV management objective.

Because the cumulative analysis is limited to VRM Class I through III viewsheds, only the potential CCFO Planning Area oil and gas lease lands in the southern half of the Planning Area are analyzed. The very few BLM-managed public lands in the northern area (north of Hollister) are not analyzed because they are designated VRM Class IV. Furthermore, cumulative actions located outside the Planning Area are also not analyzed because they are at least 15 miles from the eastern boundary of the Planning Area (i.e., where VRM Class I, II, and/or III areas are located) and would not be visibly discernible.

Cumulative impacts on visual resources from the projects considered in this analysis could occur from surface disturbance, combustion emissions and fugitive dust that alter visibility, and the introduction of man-made elements that change the landscape character. These changes could alter visible landscape form, line, color, and texture, and cause visual contrast. The cumulative effects of these changes on BLM-managed lands could degrade the visual quality of the overall landscape in the Planning Area and could be inconsistent with the objectives of VRM classes designated in the Planning Area. The degree of impact depends on the visibility of the projects and the VRM classes of the particular BLM-managed areas affected by the projects.

The 14 non-NSO leases occur on BLM-managed lands located in areas designated as VRM Class IV. Since the Class IV objective allows for major modification to the existing character of the landscape, these leases, in conjunction with any leases associated with any of the Alternatives A through E would likely be consistent with the Class IV objective.

Two cumulative projects listed in Table 5-2 (California Flats Solar and Panoche Valley Solar) would occur on private lands not managed by the BLM; but these projects would contribute to landscape changes in the Planning Area that may adversely affect the visual quality of nearby BLM-managed public lands.

The **California Flats Solar Project,** however, and any leases associated with Alternatives A, C, D, E, and F would only be located in the field of view of BLM-managed lands designated as VRM Class IV (areas near this solar project would be closed to leasing under Alternative B). Since the Class IV objective allows for major modification to the landscape that can dominate the view and be the major focus of viewers' attention, this solar project, in conjunction with any leases associated with Alternatives A, C, D, E, and F would likely be consistent with the VRM Class IV objective.

The **Solargen Panoche Valley Solar Project** would occur on private land in a valley between the Panoche Hills and Griswold-Tumey Hills areas that are BLM-managed lands designated as VRM Class III. The VRM Class III objective is to partially retain the existing character of the landscape and allow for a moderate (or lower) level of change. The change may attract the attention of the casual observer but should not dominate the view. This solar project, in conjunction with any leases associated with Alternatives A, C, D, E, and F and their close proximity to these VRM Class III areas, could attract attention and/or dominate the views of some observers on or near the hills and slopes closest to the valley resulting in an adverse, cumulative visual impact that could be inconsistent with the VRM Class III objective. Under Alternative B, areas in proximity to the Solargen Panoche Valley Solar Project would be closed to oil and gas leasing, so Alternative B would not contribute to cumulative visual impacts in this field of view.

The Panoche Hills area also contains the Panoche Hills Wilderness Study Area (WSA) designated as VRM Class I. The VRM Class I objective is to preserve the existing character of the landscape and allow only a very low level of change that must not attract attention. The Solargen Panoche Valley Solar Project, itself, would barely be discernible from the WSA due to very limited visibility and brief viewing opportunities. A limited number of power blocks could briefly be visible; they would appear as a sliver of darker shading against the lighter valley floor and would not be substantially noticeable given the viewing distance and screening by intervening landforms. The Solargen Panoche Valley Solar Project, in conjunction with any leases associated with Alternatives A, C, D, E, and F however, has the potential to result in a cumulative level of change to the landscape that is greater than that allowed under VRM Class I, which could result in an adverse, cumulative visual impact that would likely be inconsistent with the VRM Class I objective.

Under Alternative B, areas in proximity to the Solargen Panoche Valley Solar Project would be closed to oil and gas leasing, so Alternative B would not contribute to cumulative visual impacts in this field of view.

The BLM's RFD scenario for oil and gas estimates a total of 3,150 wells on private mineral estate in the Planning Area would be authorized by non-federal entities over a period of 15-20 years, at an average of approximately 150 wells/year. While some exploration could occur outside of areas with high oil and gas occurrence potential, most of the new wells would be within existing oil and gas fields that are known to be productive.

Assuming the development trends in the region continue, cumulative impacts from Alternatives A, C, D, E, and F would be minor because the increased emissions of criteria pollutants from drilling up to 37 new wells on Federal mineral estate is slight, but detectable, when combined with a total of 3,150 wells drilled on private mineral estate in areas of existing production that are likely to be developed over the next 15-20 years. Under Alternative B, lease areas within or near the cumulative projects would be closed to oil and gas leasing; therefore, Alternative B would not contribute to cumulative visual impacts in the respective fields of view.

5.3.13 Special Management Areas

Cumulative impacts to SMAs would occur when impacts of the RMPA are combined with impacts from other projects or actions within the Planning Area. The geographic scope for cumulative effects to special designations for this RMPA/EIS includes all the SMAs within the CCFO administrative boundary that are listed in Section 3.14.3.

Oil and gas development and its associated demand for land use authorizations within the Planning Area would continue to be limited by the protected status of Wilderness Areas, WSAs, national monuments, ACECs and RNAs, lands with wilderness characteristics, and other areas that contain management prescriptions (see Section 3.14). For special designation areas that would be open to leasing under the Proposed RMPA, lease stipulations (i.e., NSO, CSU, or Timing Limitations) are recommended to avoid or reduce impacts to SMAs (see Sections 4.14.3 through 4.14.8).

The BLM management decisions regarding energy are unlikely to combine with the list of cumulative projects to adversely impact SMAs in the CCFO Planning Area. This is because the existing SMAs (and the cumulative projects listed in Table 5-1 and 5-2) are more than 0.5-mile from where over 99 percent of the new wells are expected to be developed. While some exploration could occur outside of areas with high oil and gas occurrence potential, the associated disturbance would be short term because it's unlikely those wells would be productive. Furthermore, implementation of leasing stipulations and SOPs, BMPs on future oil and gas development, the Proposed RMPA would have negligible impacts on SMAs, and would not combine with present or future projects to create a cumulative effect.

5.3.14 Cultural and Heritage Resources

Cumulative effects on archaeological sites, traditional cultural properties, and historic resources are caused by impacts (both mitigated and non-mitigated) that can occur over a long period of time, resulting in the gradual but permanent loss of archaeological data as well as the diverse cultural history represented by those properties. In this sense, cumulative losses of cultural resources within the CCFO Planning Area also have the potential to indirectly affect Native American groups and various other populations with a history of settlement and land use in the region. Specific site types that embody this culture history are prehistoric habitation and resource procurement sites, rock art, sacred sites, mission-related sites, and historic ranching, mining, and agricultural sites. While impacts on historic properties may be considered "mitigated" by the retrieval of scientific data from archaeological sites or by the recovery of historical data present in built resources (e.g., buildings, structures, landscapes), the cultural heritage represented by these sites is a non-renewable resource whose loss cannot be mitigated and thus constitutes a major and unavoidable cumulative

impact. Cumulative losses to the cultural heritage of specific groups or populations may also be considered an off-site effect.

While cumulative effects on cultural resources are difficult to predict given the limited data currently available concerning cultural resources in the Planning Area, increased or strengthened management programs for the protection and long-term preservation of historic properties will ultimately prevent major cumulative effects from occurring. For all of the alternatives, there are possible cumulative effects to prehistoric and historic resources in areas that receive increased use from potential ground-disturbing activities such as those listed in Tables 5-1 and 5-2. Some projects listed in Tables 5-1 and 5-2 would require many acres of ground disturbance such as the solar PV projects. Cumulative adverse effects include the physical destruction of all or part of the resource; these resource types and areas will require more intensive management and mitigation measures by BLM as land use demands rise. These demands could be potential uses for energy and mineral, grazing, transportation, recreation, and other approved land use authorizations through time. Additionally, potential cumulative effects from increased public awareness of cultural resources increase the risk of vandalism or theft. These cumulative impacts cannot easily be measured; but over time, these activities could permanently impact resources, resulting in an irretrievable loss of non-renewable resources and information.

Assuming the development trends in the region continue, cumulative impacts to cultural resources from Alternatives A, B, C, D, E, and F would be minor because the impacts from drilling up to 37 new wells on Federal mineral estate is slight, but detectable, when combined with a total of 3,150 wells drilled on private mineral estate over the next 15-20 years. Under Alternative B, lease areas outside existing fields would be closed to oil and gas leasing; therefore, Alternative B would only contribute to cumulative impacts in the respective fields.

5.3.15 Paleontological Resources

The geographic extent of cumulative analysis for paleontological resources encompasses the 12 counties within the boundary of the CCFO Planning Area. This wide geographic scope is appropriate because it is likely that paleontological resources similar to those described under each alternative are present throughout this area and unknown, previously unrecorded paleontological resources could be uncovered within sensitive geologic units within the geographic area of cumulative effect. Cumulative impacts to paleontological resources will persist as long as ground-disturbing activities occur within the geographic extent of cumulative analysis for paleontological resources. Should paleontological resources be discovered during construction-related activities associated with the current and future projects, they would be subject to the applicable laws and regulations discussed in Section 3.16.2, which afford specific protections to discovered paleontological resources.

With regard to paleontological resources, those cumulative projects that directly result in ground disturbances are most likely to adversely affect paleontological resources. Power transmission and energy development projects, utility improvements, transportation projects, landfill projects, and commercial and residential projects have previously affected paleontological resources in San Mateo, San Francisco, Santa Cruz, Santa Clara, Stanislaus, Alameda, Contra Costa, San Joaquin, Monterey, San Benito, Merced, and Fresno Counties. The destruction of non-renewable paleontological resources as a result of project-related ground disturbances have the potential to cause the permanent loss of scientific information, thus resulting in an adverse cumulative impact over time. The implementation of management actions and mitigation measures during construction has resulted in the recovery and curation of fossil remains that may otherwise have been destroyed. Many of the recovered specimens have been made available for academic or institutional research, thereby aiding in scientific discovery.

As described in Table 5-1 and Table 5-2, there are numerous projects considered in this cumulative impact analysis. The actual number and type of paleontological resources that might be adversely affected by these projects cannot be determined without a comprehensive inventory and assessment of the paleontological

resource potential for each oil and gas lease in the CCFO Planning Area, which is beyond the reasonable scope of this EIS. Typically, the paleontological resource potential of a given project area is identified as part of the permitting process for individual undertakings, and paleontological resources are discovered during ground-disturbing activities related to project development.

Unknown, previously unrecorded paleontological resources could be found at nearly any development site within the CCFO Planning Area. As described above, projects that directly result in ground disturbances are most likely to adversely affect paleontological resources. In the CCFO Planning Area, those projects would include wind and solar farm developments, mining and quarry expansions, and conventional energy generation projects. In addition, according to the 2015 RFD Scenario, future oil and gas activity in the CCFO Planning Area is most likely to occur within geologic units with moderate to high paleontological sensitivity, which would have the potential to cause an adverse effect to fossil resources. Should paleontological resources be discovered on BLM-administered public lands during construction-related activities associated with the current and future projects, they would be subject to legal requirements designed to protect them similar to the BLM Mitigation and Management Actions described in Section 4.16, thereby reducing the effects of impacts.

Assuming the development trends in the region continue, cumulative impacts to paleontological resources from Alternatives A, B, C, D, E, and F would be minor because the impacts of drilling up to 37 new wells on Federal mineral estate is slight, but detectable, when combined with a total of 3,150 wells drilled on private mineral estate in areas of existing production that are likely to be developed over the next 15-20 years. Under Alternative B, lease areas outside existing fields would be closed to oil and gas leasing; therefore, Alternative B would only contribute to cumulative impacts in the respective fields.

5.3.16 Social and Economic Conditions

The geographic scope for cumulative impacts would be the entire CCFO Planning Area. Effects would likely be county specific because local jurisdictions or districts provide public services and utilities, and the regional labor force would be expected to come primarily from counties within the Planning Area and from neighboring counties.

Construction of cumulative projects listed in Tables 5-1 and 5-2 may bring workers to the communities proximate to and serving individual project locations. This type of temporary growth should be expected for construction of large utility-scale projects that typically require large numbers of workers, many of whom have specialized skills. However, given the existing vacancy rates and projected population growth within the regional study area (refer to Table 3.17-1), any increases to housing demand and population from the 2015 RFD Scenario is expected to have a minor cumulative contribution to the available supply and projected growth.

While some degree of social disruption is likely to accompany cumulative short-term construction worker in-migration (particularly if a number of large-scale projects are built simultaneously within the same localized area), it is difficult to predict the extent to which specific communities are likely to be affected, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond facility construction. This is because such a cumulative impact would be highly dependent on projects having overlapping construction time frames. Should cumulative project development result in a recognizable scale of temporary construction worker relocations to local communities, regardless of the amount the 2015 RFD Scenario well development contributes within these localized communities, some social change is expected to occur cumulatively but is considered to be minor.

Beneficial economic impacts would occur from the development of cumulative projects identified in Tables 5-1 and 5-2. Workforce wages and spending during the construction and operation of cumulative projects would be an economic stimulator to regional and local governments. Other important public benefits include both short-term and long-term increases in local expenditures, payrolls, and sales tax revenues. These would positively affect the economy at regional and local levels. The development of cumulative

industrial projects may adversely affect environmental amenities including environmental quality, stable rural community values, and cultural values. The development of cumulative mineral extraction projects could reduce a community's ability to attract some new types of businesses. However, other economic and demographic factors would play a role in the economic development potential of any particular location.

With respect to environmental justice, the communities of King City, San Ardo, and San Lucas contain exceptionally high concentrations of minority population, with San Lucas also containing a very high percentage of low-income population. However, when reviewing the locations of cumulative projects identified in Tables 5-1 and 5-1, these areas do not show a disproportionate amount of cumulative projects occurring. Because some of the cumulative projects listed in Table 5-1 would be located in the same local areas containing a disproportionate amount of minority and low-income populations, these projects could contribute toward impacts disproportionately borne by minority or low-income populations. However, as discussed in Section 4.17, given the small number of new wells (up to 37) and land disturbed (up to 206 acres), the 2015 RFD Scenario would have a negligible contribution toward cumulative disproportionate adverse environmental impacts within the communities of King City, San Ardo, and San Lucas.

Assuming the development trends in the region continue, cumulative impacts on social and economic conditions from Alternatives A, B, C, D, E, and F would be negligible because changes from drilling up to 37 new wells on Federal mineral estate would be hard to measure when combined with up to of 3,150 wells drilled on private mineral estate over the next 15-20 years.

5.3.17 Transportation and Travel Management

The geographic scope for cumulative impacts would be the entire CCFO Planning Area. Effects would likely be county specific because local jurisdictions or districts provide public services and utilities, but the regional transportation networks also connect with neighboring counties.

Construction of cumulative projects listed in Tables 5-1 and 5-2 would generate traffic on roadways and within communities proximate to and serving individual project locations. The greatest number of trips would be expected during construction of large utility-scale projects that typically require large numbers of workers and daily truck trips. Any adverse cumulative impact from increased daily trips may be most noticeable on rural roadways with low baseline traffic volumes. However, because these roadways have low existing traffic volumes, an increase in traffic volumes may not have adverse effects in the performance of the circulation system. The trips generated due to 2015 RFD Scenario activities would be negligible in terms of traffic volumes on the roadways serving the development of 37 wells over the next 15-20 years. Moreover, most of these trips would be temporary in nature. Therefore, vehicle trips from 2015 RFD Scenario activities would have a minor to negligible cumulative contribution to the performance of the circulation system.

When reviewing the cumulative projects that may affect the area where 2015 RFD Scenario activities are expected to occur (BLM-administered lands in Fresno, Monterey, and San Benito Counties within the area of high oil and gas occurrence potential, shown in Figure 5-1); only the projects identified in Table 5-1 could result in cumulative access impacts. As discussed in Section 4.18 (Transportation and Access), all future projects on BLM-administered lands would require further project- and site-specific environmental analysis, during which time applicable BMPs, stipulations, and other measures would be identified and imposed to reduce adverse effects to existing BLM transportation routes or access points. Furthermore, Mitigation Measure TR-1 is proposed to directly mitigate any adverse disruption effects to existing BLM travel routes or access points within the CCFO Planning Area from oil and gas development under the 2015 RFD Scenario for Alternatives B through F. With BLM's discretionary review of oil and gas development on Federal mineral estate, conflicts between the 2015 RFD Scenario activities, other projects or actions within BLM lands, and the management of existing transportation routes and access to BLM lands would be avoided.

Assuming the development trends in the region continue, cumulative impacts on transportation from Alternatives A, B, C, D, E, and F would be negligible because changes from drilling up to 37 new wells on Federal mineral estate would be hard to measure when combined with up to of 3,150 wells drilled on private mineral estate over the next 15-20 years.

5.3.18 Lands and Realty

Cumulative impacts to the BLM's lands and realty program would result from other projects or activities that combine with the impacts of the Proposed RMPA to affect the BLM's ability to authorize land uses in the Planning Area. The geographic scope for cumulative effects to lands and realty is defined as the BLM-administered surface land within the CCFO Planning Area administrative boundary, as well as the BLM-administered subsurface mineral estate underlying privately owned lands within the CCFO Planning Area (i.e., split estate).

Cumulative projects that may affect the Planning Area have been identified in Tables 5-1 and 5-2. As discussed in Section 4.19 (Lands and Realty), all oil and gas activities subject to BLM approval would require further future project- and site-specific analysis, during which time applicable BMPs, stipulations, and other COAs would be identified and imposed on the proposed leases. With BLM's discretionary review of oil and gas development on Federal mineral estate, conflicts between energy-related actions and other projects or actions within the Planning Area would be avoided.

Assuming the development trends in the region continue, cumulative impacts on lands and realty from Alternatives A, B, C, D, E, F would be negligible because effects on land use and valid existing rights from drilling up to 37 new wells on Federal mineral estate would be hard to measure when combined with up to of 3,150 wells drilled on private mineral estate over the next 15-20 years.

5.3.19 Utility Corridors and Communication Sites

Cumulative impacts to utility corridors and communication sites would result from impacts of the Proposed RMPA that combine with impacts of other projects or actions within the Planning Area. The utility corridor Planning Area for this RMPA/EIS is defined as oil and gas pipelines, transmission lines, and communication sites within the CCFO Planning Area.

The collective effects on utility corridors and communication sites are interrelated with various energy-related growth activities in the Planning Area. Increased demand for oil and gas development would increase the use of existing ROW corridors, as well as require the construction of new ancillary facilities such as pipelines and connectors, compressor stations, or transmission tie-ins. As discussed in Sections 4.20.3 through 4.20.8, new utility facilities associated with oil and gas development would require further project- and site-specific analysis by the BLM, during which time applicable BMPs, stipulations, and other COAs would be identified and imposed as necessary. With BLM's discretionary review of oil and gas development within its administrative area, potential conflicts with other cumulative projects or actions within the Planning Area would be avoided.

Assuming the development trends in the region continue, cumulative impacts on utility corridors and communication sites from Alternatives A, B, C, D, E, and F would be negligible because effects on land use from drilling up to 37 new wells on Federal mineral estate would be hard to measure when combined with up to of 3,150 wells drilled on private mineral estate over the next 15-20 years.

5.3.20 Wild and Scenic Rivers

Cumulative impacts to National Wild and Scenic Rivers (NWSRs) would result from impacts of the Proposed RMPA that combine with impacts of other projects or actions within the Planning Area. The NWSR Planning Area for this RMPA/EIS is defined as eligible river segments within the CCFO Planning Area.

Designated NWSRs would not cross or be located in the vicinity of Federal mineral estate, and as such would not be affected by the Proposed RMPA.

Oil and gas development and its associated demand for land use authorizations within the Planning Area would continue to be limited by the management prescriptions for eligible and NWSRs (see Section 3.21). For eligible river segments that would be open to leasing under the Proposed RMPA, lease stipulations (i.e., NSO or CSU) are recommended to avoid or reduce impacts to NWSRs (see Sections 4.21.3 through 4.21.8). With implementation of these stipulations on future oil and gas development, the Proposed RMPA would have negligible impacts on NWSRs. The BLM would also implement management direction through project-level decision-making to avoid impacts to river values from other proposed or future projects, as required by BLM Manual 6400.

The BLM management decisions regarding energy are unlikely to combine with the list of cumulative projects to adversely impact eligible river segments in the CCFO Planning Area. This is because the eligible river segments (and the cumulative projects listed in Table 5-1 and 5-2) are more than 0.5-mile from where over 99 percent of the new wells are expected to be developed. While some exploration could occur outside of areas with high oil and gas occurrence potential, the associated disturbance would be short term because it's unlikely those wells would be productive. With BLM's discretionary review and approval of future proposed actions near eligible NWSRs, the Proposed RMPA would not combine with other existing or future projects to create a cumulative effect because implementation of leasing stipulations and SOPs, BMPs on future oil and gas development, the Proposed RMPA would have negligible impacts on SMAs, and would not combine with present or future projects to create a cumulative effect.

6. Consultation and Coordination

6.1 Introduction

This document has been prepared with input from interested agencies, organizations, and individuals. Public involvement is a vital component of the Resource Management Planning (RMP) process and Environmental Impact Statement (EIS) preparation for vesting the public in the effort and allowing for full environmental disclosure. Guidance for implementing public involvement is codified in 40 Code of Federal Regulations (CFR) 1506.6 and 43 CFR 1610, thereby ensuring that the BLM makes a diligent effort to involve the public in the preparation of RMPs EISs. Public involvement for the Central Coast RMPA/EIS is being conducted in two phases, as follows:

- Public scoping prior to National Environmental Policy Act (NEPA) analysis to obtain public input on issues, the scope of the analysis, and to develop the proposed alternatives, and
- Public review and comment on the Draft RMPA/EIS, which includes analyzing possible environmental impacts and identifying the final Preferred Alternative.

A summary of public involvement during the Central Coast RMPA planning process is presented in Section 6.2.

6.2 Outreach

6.2.1 Notice of Intent/Notice of Availability

BLM published the Notice of Intent (NOI) to Prepare a Resource Management Plan Amendment (RMPA) and EIS for Oil and Gas Leasing and Development in the *Federal Register* on August 5, 2013.

BLM published the Notice of Availability (NOA) for the Central Coast Draft RMPA and Draft EIS in the *Federal Register* on January 6, 2017. The NOA marked the beginning of a 90-day public comment period.

6.2.2 Advertisements and Announcements

BLM published a news release on the California State Office website announcing start of the planning review of oil and gas development on public lands managed by the CCFO on August 2, 2013. The BLM published the legal notice in the following local newspapers: *San Benito Today*, the *Monterey Herald*, the *Fresno Bee*, and the *Sacramento Bee*.

BLM sent emails directly to interest parties and issued a press release on February 21, 2017 announcing the date, time, and location of the three public meetings held on the Draft RMPA/EIS. The results of these meetings are described in Section 6.2.4.3.

6.2.3 BLM Website

The BLM maintains a website (https://tinyurl.com/jhsrwrp) to inform public land visitors about upcoming events, activities, and planning information. It is commonly used to announce the availability of environmental review documents, including the Draft RMPA and Draft EIS for Central Coast Oil and Gas Leasing and Development. The website provides background information about the project, Citizen's Guide to NEPA, *Federal Register* NOI, all public scoping handouts, news releases, and a downloadable version of the Draft RMPA/EIS, announcements of upcoming meetings, plus an opportunity for people to e-mail comments directly to the BLM office.

6.2.4 Public Meetings

6.2.4.1 Scoping Meetings

Four public scoping workshops were held in January and February 2014 to initiate the public involvement process for the Central Coast RMPA. Each meeting included a PowerPoint presentation to provide context for the proposed project and an information package that included materials to introduce the concept of "scoping," the Central Coast RMPA, background regarding the project, a Comment Sheet, and a map package. The public scoping meetings were held at:

- Hollister, California, at the San Juan Oaks Golf Course, January 29, 2014;
- Sacramento, California, at the Doubletree Hotel, February 4, 2014;
- Salinas, California, at the Cesar Chavez Library, February 11, 2014; and
- Coalinga, California, at the Harris Ranch Inn & Restaurant, February 12, 2014.

BLM's official scoping comment period began August 5, 2013, with the publication of the NOI in the *Federal Register*. The comment period ran for 207 days ending on February 28, 2014 to incorporate the comments received during the public scoping workshops. BLM received 132 unique written responses to the NOI for the Central Coast RMPA/EIS. This included a letter from the non-governmental organization CREDO that included 10,577 electronic signatories and a form letter from three individuals. Members of the general public provided 110 written submissions, organizations or non-profit groups submitted 13 comments, and businesses submitted 2 comments. Federal agencies submitted 2 comments, local government agencies submitted 4 comments, and tribal individuals and organizations submitted 1 written comment.

6.2.4.2 Social and Economic Workshop

A social and economic strategies workshop was held to provide an opportunity for local government officials, community leaders, and other citizens to discuss regional economic conditions, trends, and strategies with BLM managers and staff. The workshops assisted in identifying the ways public land resources are integrated into the local economy and way of life and in identifying opportunities for collaborative, stewardship-based management proposals. The workshop also devoted some time to introducing participants to economic concepts, the sources of economic data, the data itself, and the processes of economic analysis. The workshop was held in the Carpenter's Hall, Marina in Monterey County on February 4, 2015.

There were 11 attendees at the workshop, including local agency representatives, oil and gas industry representatives, and members of the general public. Information obtained at these meetings is included in the social and economic analysis of the RMPA/EIS (Sections 3.17 and 4.17) and elsewhere as appropriate.

6.2.4.3 Draft EIS/RMPA Public Meetings

The BLM held three public meetings on March 14, 15, and 16, 2017. The three meetings provided an opportunity for the public, community and interest groups, and government agencies to obtain more information on the project, learn more about the NEPA environmental review processes, ask questions regarding the project, and provide comment on the RMPA/EIS. Table 6-1 presents information about the public meetings held for the Draft RMPA/EIS during the public comment period.

Table 6-1. Draft RMPA/EIS Public Meetings

Date and Time	Location	Signed-in	Speakers
Tuesday, March 14, 2017 6 pm to 8 pm	**Coalinga** Harris Ranch 24505 West Dorris Avenue Coalinga, CA 93210	9	3
Wednesday, March 15, 2017 4 pm to 6 pm	**Hollister** San Juan Oaks Golf Club 3825 Union Road Hollister, CA 95023	54	22
Thursday, March 16, 2017 4 pm to 6 pm	**Salinas** California State University Monterey Bay at Salinas City Center 1 Main Street Salinas, CA 93901	50	29

Each meeting began with a PowerPoint presentation to provide context for the proposed project and the NEPA process, and then provided time for the public to speak. Topics of concern included: air quality, climate change, public health and safety, seismicity, water use and contamination, local laws, environmental justice, biological resources, BLM's mission statement, and alternatives.

Handouts and information materials available at the meeting were the PowerPoint presentation, a project fact sheet, self-addressed comment forms, and speaker registration cards. Other information made available for public review during the public comment meetings included an overview map of the RMPA/EIS Decision Area, figures depicting each of the five alternatives presented in the Draft RMPA/EIS, and a series of display boards that showed active oil and gas wells, oil and gas leasing areas, oil and gas potential, air basins, area hydrology, and fluid materials leasing.

A Public Meetings Summary Report, which includes the meeting handouts, is included as Appendix H in this Proposed RMPA/Final EIS.

6.2.5 Regulatory Required Consultation

6.2.5.1 U.S. Fish and Wildlife Service

Previous formal consultations with the USFWS were conducted for the 2007 Hollister RMP/EIS with a Biological Opinion (BO) issued in 2007. On May 31, 2018, the BLM Central Coast Field Office formally initiated consultation with the USFWS on this RMPA/EIS. Consultation will be ongoing as the BLM proceeds with this planning process.

6.2.5.2 Native American Tribes

The BLM-administered public lands in Fresno, Monterey and San Benito Counties are within the ancestral homeland of the [Federally-recognized] Tachi-Yokuts Tribe. The Central Coast Field Office sent a letter to the Tachi-Yokuts Tribe, and more than two dozen other non-Federally recognized Native American tribal representatives, in 2014 during the EIS scoping process. In doing so, the BLM initiated consultation as required by the National Historic Preservation Act and Executive Order 13007 "Indian Sacred Sites." Consultation efforts also included the distribution of consultation letters to 28 tribal entities on January 15, 2014. In some cases a letter was sent to multiple individuals belonging to the same tribal organization:

- Amah Mutsun Ohlone
- Amah Mutsun Tribal Band
- California Valley Miwok Tribe
- Costanoan Rumsen Carmel Tribe
- Esselen Tribe of Monterey County
- Mr. Andrew Galvan
- Ms. Judith Bomar Grindstaff
- Ms. Ann Marie Sayers of Indian Canyon
- Ms. Jakki Kehl
- Mr. Richard Larios
- Muwekma Ohlone Tribe
- Ohlone-Costanoan Esselen Nation
- Pajaro Valley Ohlone Indian Council
- Ms. Katherine Erolinda Perez
- Salinan Nation Cultural Preservation Association
- Salinan Nation
- Salinan Tribe of Monterey, San Luis Obispo, and San Benito Counties
- Santa Rosa Rancheria of Tachi Yokuts
- Trina Marina Ruano Family
- Xolon Salinan Tribe
- Ms. Linda Yamane

Of the tribes contacted, the Ohlone/Costanoan-Esselen Nation responded with a letter indicating a desire for consultation on any planned projects that may adversely impact known or predicted cultural resources and sacred sites within the tribe's aboriginal territory.

No other written comments were received from tribal agencies during the scoping period. The BLM sent letters to the Tachi-Yokuts Tribe, and other Native American representatives, again in 2017 to invite comments on the Draft EIS. Consultation is ongoing and will continue throughout the planning process to ensure that the concerns of tribal groups are considered in development and implementation of the RMPA.

6.2.5.3 State Office of Historic Preservation

In order to comply with the requirements of Section 106 of the National Historic Preservation Act (NHPA), the BLM must consider potential impacts to cultural resources that may occur as a result of authorized activities. BLM permitted actions related to the extraction of federally managed fluid minerals, including those beneath privately owned surface lands, are subject to NHPA.

The BLM has a California State Protocol Agreement with the State Historic Preservation Officer (SHPO) and national policy (IM-2018-014) that provides direction on how the NHPA compliance process will be fulfilled on private property. The emphasis of this compliance process insures private property rights are maintained while providing reasonable procedures to insure impacts to cultural resources are minimized and avoided whenever possible. The BLM may also impose a condition of approval (COA) on a private property APD that requires the operator to inform the BLM if the operator discovers any historic properties during the course of the drilling and production operations approved under the APD.

The BLM completed two rounds of consultation with the California Office of Historic Preservation's State Historic Preservation Officer (SHPO) beginning in January 2014 for scoping, and again in January 2017 upon release of the Draft RMPA and Draft EIS. Consultation is ongoing and will continue throughout the planning process to ensure that the concerns of tribal groups are considered in development and implementation of the RMPA.

6.2.6 Other Outreach and Consultation

6.2.6.1 Federal, State, and Local Governments

The BLM sent letters to 35 Federal, State, and local agencies inviting them to be cooperating agencies for the project; however, none of the agencies accepted this invitation. The public scoping process provided opportunities for Federal, State, and local agencies to express their comments and provided meaningful input to the process. During scoping, the BLM received written submissions from two Federal agencies, the National Park Service and the U.S. Environmental Protection Agency, and four written submissions from local agencies, Kern County, Monterey County, San Joaquin Valley Air Pollution Control District, and Stanislaus County.

Through a Memorandum of Understanding the BLM completed an evaluation with the U.S. EPA, National Park Service, U.S. Forest Service and U.S. Fish and Wildlife Service on air quality analysis and mitigation related to oil and gas leasing and development. To provide additional support for the RMPA/EIS, the CCFO developed an Air Quality Technical Support Document (BLM, 2019), in coordination with an Air Quality Technical Working Group representing partner agencies, which is included as Appendix K in this RMPA/EIS.

6.2.6.2 Organizations and Individuals

In order to identify current issues and concerns regarding cultural resources in the CCFO Planning Area, letters were sent to 33 government agencies and historical societies, see Section 3.15.4 for the full list. No comments or concerns regarding cultural resources were raised by the respondents.

7. References

7.1 References for Executive Summary

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