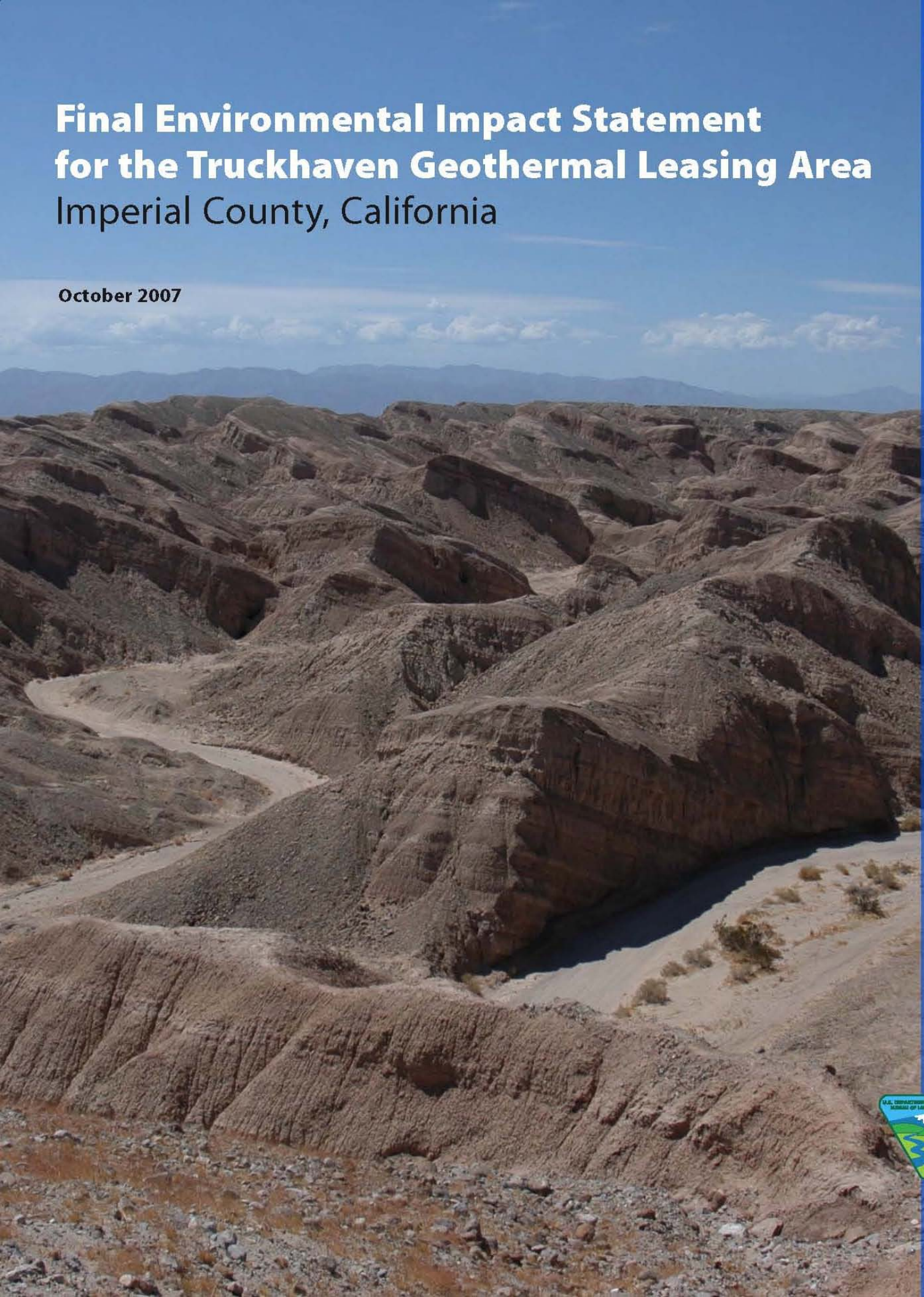
Final Environmental Impact Statement for the Truckhaven Geothermal Leasing Area

Imperial County, California

October 2007



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Bureau of Land Management

Final Environmental Impact Statement

Truckhaven Geothermal Leasing Area

For the

El Centro Field Office
El Centro, California

October 2007

Vicki L. Wood
Field Manager

10/1/2007
Date

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
El Centro Field Office
1661 South 4th Street
El Centro, California 92243-4561

October 2007

Dear Reader/Interested Party:

I am pleased to announce the availability of the Truckhaven Final Environmental Impact Statement (FEIS) for leasing of geothermal energy resources. The FEIS covers approximately 14,731 acres of Bureau of Land Management (BLM)-managed geothermal resources in the area known as the Truckhaven Geothermal Leasing Area, located in western Imperial County, California.

The FEIS analyzes three alternatives: (1) No Action, in which no Federal geothermal resources would be leased; (2) Address Only Pending Noncompetitive Leasing Applications, in which only the 7,051 acres of Federal geothermal resources with existing noncompetitive lease applications would be leased; and (3) the Proposed Action, in which all Federal geothermal resources in the Truckhaven Geothermal Leasing Area would be leased. The FEIS has been prepared in accordance with the Federal Land Policy and Management Act (FLPMA) and the National Environmental Policy Act (NEPA). The document has been sent to members of the public who requested a copy and to pertinent local, State, Tribal, and Federal government entities.

This FEIS reflects many changes and clarifications requested during the 60-day public comment review for the Draft EIS, which was released in February 2007. All timely filed comment letters and emails received by BLM during the public comment period and our responses to the substantive comments can be found on a CD-ROM located in the back pocket of this document. The comments and responses are in Adobe Acrobat Reader 7.0 format, which is included for your convenience. If you are unable to use the electronic version of the comment/response document, Paper copies and CD-ROM versions of the FEIS may be obtained by contacting the El Centro Field Office at the address above. The document will also be available on the Internet at http://www.blm.gov/ca/st/en/fo/elcentro.html.

Many reviewers were concerned that geothermal leasing would effectively remove from off-road recreational use between 7,051 and 14,731 acres of land within the Ocotillo Wells State Vehicular Recreation Area. The FEIS has been revised to further clarify how much land would be disturbed or otherwise affected by the leasing proposal. Initially, up to 502 acres of land would be utilized for geothermal energy development during site construction over the short term. After construction, 97 acres of land would be rehabilitated, leaving 405 acres committed to well pads, roads, pipelines and power plants for the life of the project. This represents around one percent of the total land within the study area that would be committed to energy development for up to 90 years if all lease term renewals are exercised. The EIS assesses the proposed mitigation and best management practices that would limit conflicts between energy development and existing routes and other recreational facilities and uses.

Some reviewers claimed that the amount of land that would be needed for geothermal development at Truckhaven was overstated. These commenters believe that several wells could be drilled from the same well pad, thereby reducing the footprint by up to 50 percent of the land needed for wells, pipelines, transmission and distribution power lines and access roads.

This FEIS will be circulated for a 30-day public comment period. All comments must be postmarked 30 days from the date of that the Environmental Protection Agency (EPA) publishes the *Notice of Availability* of this EIS in the Federal Register. Comments received during this period will be considered and may be used to revise the FEIS. If the revisions are not substantive or do not change the preferred alternative significantly, a Record of Decision will be issued. If the comments identify significant new information which changes the preferred alternative, a supplemental EIS may be issued and another public comment period held.

We are pleased to provide this copy of the Truckhaven FEIS for your reference and extend our appreciation for your interest and assistance during this process. We look forward to your continued participation.

Sincerely,

Vicki L. Wood

Vicki L. Wood
Field Manager

El Centro Field Office
Truckhaven Geothermal Leasing
Final Environmental Impact Statement

Lead Agency: Bureau of Land Management
El Centro Field Office
El Centro, California

For Further Information Contact: John Dalton
Bureau of Land Management
California Desert District Office

Abstract

This Final Environmental Impact Statement (FEIS) addresses the possible leasing of geothermal resources in the Truckhaven Geothermal Leasing Area in Imperial County, California. The proposed action area encompasses 40,320 acres, of which 14,731 acres are Federal mineral resource lands managed by the Bureau of Land Management (BLM), El Centro Field Office. The FEIS identifies impacts that would potentially result from the leasing of the geothermal energy resources, including impacts on the flat tailed horned lizard, cultural resources, off-highway vehicle recreation, and other sensitive resource values.

Three alternatives are presented in Chapter 2: Alternative 1 – No Action Alternative (No Leasing); Alternative 2 – Address Only Pending Noncompetitive Leasing Applications; and Alternative 3 (Proposed Action) – Lease All BLM-managed Geothermal Resources at the Truckhaven Geothermal Leasing Area. Chapter 3 presents the existing conditions in the project area, and Chapter 4 presents the impacts expected from implementing each of the alternatives.

The El Centro Field Manager has authority for site management of any future leasing activity and is the BLM's Authorized Officer for preparing this Final EIS.

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List of Abbreviations and Acronyms

ABDSP	Anza-Borrego Desert State Park
ACEC	Areas of Critical Environmental Concern
AMSL	above mean sea level
BLM	U.S. Department of the Interior Bureau of Land Management
B.P.	Before Present
BMPs	best management practices
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CDCA	California Desert Conservation Area
CDFG	California Department of Fish and Game
CDPA	California Desert Protection Act
CDPR	California Department of Parks and Recreation
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
CPUC	California Public Utilities Commission
CSLC	California State Lands Commission
dBA	A-weighted decibels
EGS	enhanced geothermal systems
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
°F	(degrees) Fahrenheit

FLPMA	Federal Land Policy and Management Act
G-E-M	Geology-Energy-Minerals
H_2S	Hydrogen Sulfide
ICAPCD	Imperial County Air Pollution Control District
IID	Imperial Irrigation District
KGRA	known geothermal resource area
L_{eq}	equivalent noise level
LOS	level of service
mg/L	milligrams/liter
MOU	Memorandum of Understanding
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NAFEC	Naval Air Facility El Centro
NEPA	National Environmental Policy Act
NLCS	National Landscape Conservation System
NPDES	National Pollutant Discharge Elimination System
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
NRHP	National Register of Historic Places
O_3	ozone
OHV	off-highway vehicle
PM	respirable particulate matter
PM_{10}	respirable particulate matter less than 10 microns in diameter
$PM_{2.5}$	respirable particulate matter less than 2.5 microns in diameter
POV	personally owned vehicle
PPA	Power Purchase Agreement
RFD	reasonably foreseeable development
ROW	right-of-way

RSZ	Range Safety Zone
SBM	San Bernardino Meridian
SDG&E	San Diego Gas and Electric
SIP	State Implementation Plan
SO_2	sulfur dioxide
SR	State Route
SWPPP	Stormwater Pollution Prevention Plan
TDS	total dissolved solids
USDOE	U.S. Department of Energy
USDI	U.S. Department of the Interior
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
VOCs	volatile organic compounds
VRM	Visual Resource Management

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Executive Summary

This Final Environmental Impact Statement (EIS) analyzes the potential impacts of proposed leasing and development of federally owned geothermal resources in the Truckhaven Geothermal Leasing Area in Imperial County, California. The area of analysis is located in western Imperial County, north of State Route (SR) 78, generally west of SR-86 and south of County Highway S-22. It is located east of the Anza-Borrego Desert State Park and lies almost entirely within the boundaries of the Ocotillo Wells State Vehicular Recreation Area.

Purpose and Need

The purpose of the proposed action is to:

(1) Determine whether to approve leases for Federal geothermal resources on public lands with pending noncompetitive lease applications in the Truckhaven Geothermal Leasing Area; and

(2) Determine whether to offer competitive leases for Federal geothermal resources on public lands in the Truckhaven Geothermal Leasing Area that do not have pending lease applications.

The need for Federal action and this EIS arises from pending applications, national policy, and Congressional direction. Five applications, filed in 2000 and 2001, are pending for noncompetitive leases of geothermal resources in the Truckhaven Geothermal Leasing Area. The National Energy Policy, released in May 2001, directed the Secretary of the Interior to reduce delays in processing geothermal leases. President Bush issued Executive Order 13212 in May 2001 that directed Federal agencies to increase production and transmission of energy in an environmentally safe manner. Congress passed the Energy Policy Act of 2005, which made significant changes to the Geothermal Steam Act of 1970, to encourage leasing and development of geothermal resources from public lands. The U.S. Department of the Interior's policy, consistent with Section 2 of the Mining and Mineral Policy Act of 1970 and Sections 102(a)(7), (8), and (12) of the Federal Land Policy and Management Act of 1976, is to encourage mineral resource development, including geothermal resources, on Federal lands. The Geothermal Steam Act of 1970 (43 CFR Part 3200 et seq.) provides regulatory guidance for geothermal leasing by the Bureau of Land Management (BLM).

Although this is a Federal action taking place on Federal land, this proposal also meets one of California's Renewables Portfolio Standard Program goals, which calls for 20 percent of California's energy to be derived from renewable sources by 2010.

Planning Process and Public Collaboration

This document has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and the Federal Land Policy and Management Act, and is in conformance with the California Desert Conservation Area Plan (1980), as amended.

The Notice of Intent to Prepare an EIS for the Truckhaven Geothermal Leasing Area was published in the Federal Register on July 27, 2005. Scoping documents were sent to the public listed on the BLM's mailing list as well as to organizations, groups, and individuals requesting copies of the materials.

During the scoping period, BLM held four public meetings in El Centro, San Diego, Long Beach, and Anaheim, between August 3 and 10, 2005. It should be noted that, at that time the project scope included the Superstition Mountains geothermal resource area to the south of Truckhaven. Potential leasing in that area, which is under the jurisdiction of the U.S. Navy, will be analyzed in a separate NEPA document with the U.S. Navy as the lead agency. During the scoping period, 13 written responses were received in response to the project.

Although many of the comments heard during the scoping meetings related to issues at the Superstition Mountains area, comments also were made by members of the public, interest groups, and agency representatives regarding the Truckhaven proposal. These comments related to the geothermal development's impacts on recreation, vegetation, air quality, endangered species, surface and groundwater quality and the Salton Sea, and the effects of hazardous materials.

After the release of the Draft EIS in February 2007, BLM held three meetings in the project area and El Centro to discuss the findings of the Draft EIS and gather public comments. The meetings were held on March 20 and 21, 2007, in Borrego Springs, Salton City, and El Centro and were attended by approximately 45 people. Most of the comments dealt with the potential impact that possible geothermal leasing and development would have on recreational off-road vehicle use at the Ocotillo Wells State Vehicular Recreation Area. The only issue raised at the El Centro meeting was the potential impact to cultural and archaeological resources. BLM received approximately 600 comment letters in response to the Draft EIS. These are contained on a CD-ROM found in the back pocket of this Final EIS, along with BLM's responses to the substantive comments.

Management Alternatives

Alternative 1 – No Action Alternative (No Leasing)

Under the No Action Alternative, BLM would not approve the existing noncompetitive lease applications or offer any other lands for leasing. Currently, the issuance of these geothermal leases is not approved by any land use plans or a Programmatic EIS prepared for the Truckhaven Geothermal Leasing Area.

Alternative 2 – Address Only Pending Noncompetitive Lease Applications

Under Alternative 2, BLM would offer the 11 sections of land with pending geothermal noncompetitive lease applications filed between 2000 and 2001. Under this alternative, BLM would lease only tracts for which it currently has these noncompetitive lease applications.

The geothermal leases would be subject to standard stipulations. Additional mitigation measures would be developed as a part of future, site-specific analyses and permitting considerations covering subsequent proposed exploration, development, or utilization activities.

Alternative 3 (Proposed Action) – Lease All BLM-managed Geothermal Resources

Under Alternative 3, BLM would approve leases for sections with the pending noncompetitive leasing applications and offer competitive leases for all other BLM-managed lands at Truckhaven, totaling 14,731 acres. The geothermal leases would be subject to standard stipulations. Additional mitigation measures would be developed as a part of future, site-specific analyses and permitting considerations covering subsequent proposed exploration, development, or utilization activities.

Environmental Consequences

Impacts from the proposed action would potentially occur to the following resources and uses:

- Air quality
- Archaeology/cultural resources
- Fish and wildlife
- Human health and safety/hazardous materials
- Off-highway vehicle recreation
- Special status species
- Visual resources

As appropriate, mitigation measures would be implemented as part of the proposed action to reduce these impacts.

Organization of this Document

Chapter 1 provides an introduction and background on geothermal leasing, a discussion of the purpose and need for the proposed action, and a discussion of programs and

policies that relate to the purpose and need. Chapter 2 presents the proposed action and a reasonable range of alternatives. It also includes a summary of BLM's reasonably foreseeable development scenario for development of geothermal energy at the Truckhaven Geothermal Leasing Area. Chapter 3 describes existing environmental and socioeconomic conditions for the proposed action area. Chapter 4 assesses the direct, indirect, and cumulative impacts of the proposed action and alternatives. Chapter 5 describes the consultation and coordination activities that have taken place during the EIS process. Chapter 6 contains a list of preparers, and Chapter 7 lists the references cited in this document. Five appendices are included in this Final EIS.

Chapter 1

Purpose and Need

1.0 Introduction

This Final Environmental Impact Statement (EIS) has been prepared to analyze and disclose the potential environmental impacts on the natural and human environment that could result from the proposed leasing of Federal geothermal resources in the Truckhaven Geothermal Leasing Area. The EIS considers approximately 14,731 acres of United States Department of the Interior (USDI) Bureau of Land Management (BLM)-managed public lands in the area known as the Truckhaven Geothermal Leasing Area, located in western Imperial County, California (Figure 1-1). The minerals are managed by the BLM El Centro Field Office.

This document has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality regulations (40 Code of Federal Regulations (CFR) 1500-1508) implementing NEPA, and the Federal Land Policy and Management Act (FLPMA) of 1976, and is in conformance with the California Desert Conservation Area (CDCA) Plan (1980), as amended.

The proposed action considered in this Final EIS—issuing leases for geothermal resources—is considered a Federal action and a commitment to resource development; therefore, it requires NEPA analysis. A lease for geothermal resources confers on the lessee the right to future exploration and development of geothermal resources within the lease area; however, such a lease does not confer on the lessee the right to explore for or develop geothermal resources if such activities require surface disturbance or other extensive operations.

Issuance of geothermal leases could have indirect impacts because such leasing represents a commitment of resources, and it is reasonably expected that subsequent exploration, development, production, and closeout activities would occur. Therefore, the Final EIS presents a broad scope analysis of the potential indirect and cumulative impacts from geothermal leasing.

Currently, five noncompetitive geothermal lease applications are pending with BLM on approximately 7,051 acres of Federal mineral estate within the proposed action area. Before BLM may make a decision as to whether or not to issue these leases and offer future leases in the project area, the lands must first be assessed under NEPA requirements and procedures established under the Council on Environmental Quality regulations. The BLM El Centro Field Office has prepared this EIS to assess the potential environmental impacts from geothermal exploration, development, and operations that could reasonably occur if the lands are leased.

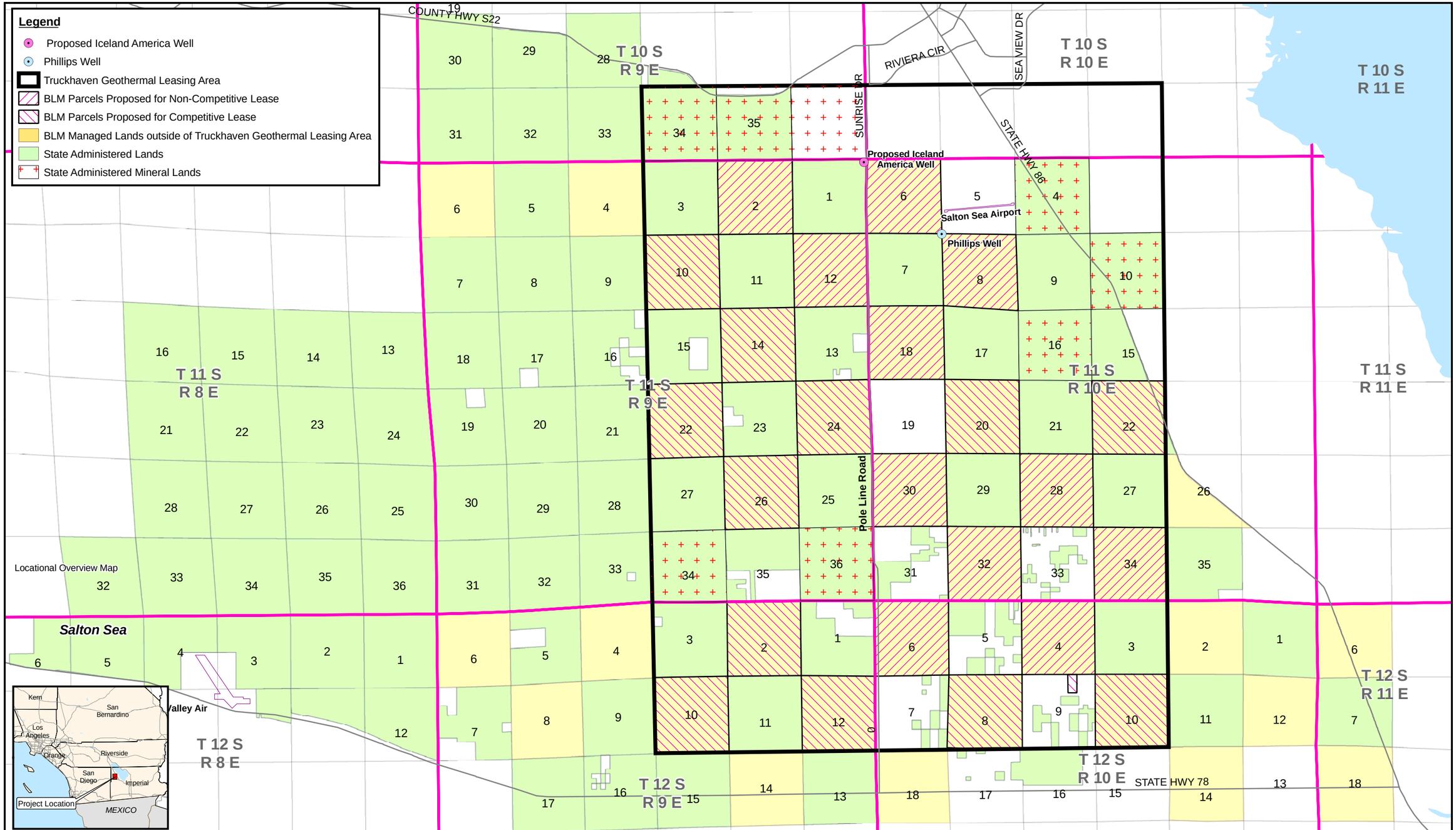
1.1 Background for Geothermal Resources and Leasing

Geothermal resources are underground reservoirs of hot water or steam created by heat from the earth. Geothermal steam and hot water can reach the surface of the earth in the form of hot springs, geysers, mud pots, or steam vents. These resources also can be accessed by wells, and the heat energy can be used for generating electricity or for other direct uses, such as heating greenhouses and aquaculture operations or for dehydrating vegetables.

On May 2, 2007, BLM issued new regulations governing geothermal resources (Federal Register: May 2, 2007 (Volume 72, Number 84, Part II)). Regulations in existence at the time of the non-competitive lease applications would govern those leases should they be issued. Any future competitive leases would be regulated under the new rule. The non-competitive leases issued under the old rule could be converted to the new rule if desired by the lessees.

Under the new rule, geothermal leases would be granted for a primary term of ten years, with two extensions of up to five years each (43 CFR 3207.10-12). The terms of the lease require the lessee to show a certain level of diligence toward developing the geothermal resources within the lease area, or the lease may be terminated. Once an area is developed for productive use of geothermal energy, the lease allows the lessee use of the resource for 35 years (43 CFR 3207.15), with a right of renewal for up to another 55 years (43 CFR 3207.16). Geothermal exploration and production on Federal land conducted through leases is subject to terms and stipulations to comply with all applicable Federal and State laws pertaining to various considerations for sanitation, water quality, wildlife, safety, cultural resource protection, and reclamation. Lease stipulations may be site specific and are derived from the environmental analysis process (USDI BLM 2002).

If the lands are leased to multiple parties (i.e., multiple leases), BLM would require them to enter into a unitization agreement under 43 CFR 3280 to ensure the orderly development of the field. Unitization of lands leased for geothermal exploration, development and utilization is an effective tool to allow for the efficient use of the geothermal resources while minimizing the surface impacts from such utilization. The requirements for unitizing federal lands leased for geothermal resources may be found under 43 CFR 3280 identified as Geothermal Resources Unit Agreements. When leased lands are unitized, a single operator, known as the Unit Operator, is selected by the various lessees and their interests to conduct exploration and development activities on their behalf within the unit, without regard to lease boundaries or lease ownership. The various lessees and interests all share in the cost of exploration, as well as the benefits from production of any discovered commercial resource. Through this process, the Unit Operator is able to propose a reasonable plan to BLM for exploring for the geothermal resource based upon geology, and not land status. It also avoids the situation where each



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Map Reference: California Bureau of Land Management

TRUCKHAVEN GEOTHERMAL LEASING AREA

FINAL EIS

Figure 1-1
Lands Proposed for Leasing

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\edms-projects\blm truckhaven\figure 1-1 site location map-new.mxd

and every lessee may conduct exploration activities on their lease and independent of the other lease holders in the immediate area, which can result in greater impacts to both surface and subsurface resources. Since unitization can and does reduce the overall impacts to a given area under lease, a requirement for the Federal geothermal lessees to unitize their interests can be consider an effective tool to help mitigate the potential impact to surface uses, including recreational use.

In the Truckhaven Geothermal Leasing Area, the BLM will require the lessees to join together under a Unit Agreement prior to the leases becoming effective. In this way, the lessees are motivated to unitize as quickly as possible so that the Unit Operator may proceed with submitting a Unit Agreement to BLM for review and approval. Once BLM approves the Unit Agreement, then BLM will make the leases effective on the first of the month following the approval. It is anticipated that the Unit Operator will then be motivated to submit a program to begin exploration of the unit area.

Certain lands are designated as known geothermal resource areas (KGRAs) and are offered only through a competitive bid process. KGRAs are areas where BLM has determined, based on geologic and technical evidence, that a person with geothermal knowledge would spend money to develop a geothermal resource, areas that are near wells capable of commercial production of geothermal fluids, or areas where there is a competitive interest in geothermal resource development; there is not a singular criteria for KGRA designation. The intent of the competitive lease approach is to allow the public to receive a fair market value for leasing the right to develop these resources. Within the El Centro Field Office's area of jurisdiction, 118,720 acres of land are classified as KGRAs (USDI BLM 1999): Salton Sea, Glamis, Dunes, East Mesa, East Brawley, South Brawley, and Heber (Figure 1-2). Two other previously classified KGRAs – Westmoreland and North Brawley – were declassified in the 1980s because they did not contain Federal land (Hagerty 2007).

Until the passage of the Energy Policy Act of 2005 (Public Law 109-58), lands outside of KGRAs could be leased noncompetitively. The lands within the Truckhaven Geothermal Leasing Area are not within a KGRA at this time and were open to noncompetitive leasing up until the passage of this Act. The five existing lease applications at Truckhaven were filed in 2000 and 2001 and are considered noncompetitive applications. Section 222 of the Energy Policy Act modified the Geothermal Steam Act of 1970 to allow only competitive lease sales for Federal geothermal resources. Noncompetitive leases would be allowed for tracts that do not receive bids in a competitive lease sale.

In accordance with the Geothermal Steam Act and 43 CFR 3201.10:

(a) BLM may issue leases on:

(1) Lands administered by the U.S. Department of the Interior, including public and acquired lands not withdrawn from such use;

(2) Lands administered by the U.S. Department of Agriculture with its concurrence;

(3) Lands conveyed by the United States where the geothermal resources were reserved to the United States; and

(4) Lands subject to Section 24 of the Federal Power Act, as amended (16 United States Code (U.S.C.) 818), with the concurrence of the Secretary of Energy.

(b) If your activities under your lease or permit might adversely affect a significant thermal feature of a National Park System unit, BLM will include stipulations to protect this thermal feature in your lease or permit. These stipulations will be added, if necessary, when your lease or permit is issued, extended, renewed, or modified.

43 CFR 3201.11 states the following:

What lands are not available for geothermal leasing?

BLM will not issue leases for:

(a) Lands where the Secretary has determined that issuing the lease would cause unnecessary or undue degradation of public lands and resources;

(b) Lands contained within a unit of the National Park System, or otherwise administered by the National Park Service;

(c) Lands within a National Recreation Area;

(d) Lands where the Secretary determines after notice and comment that geothermal operations, including exploration, development or utilization of lands, are reasonably likely to result in a significant adverse effect on a significant thermal feature within a unit of the National Park System;

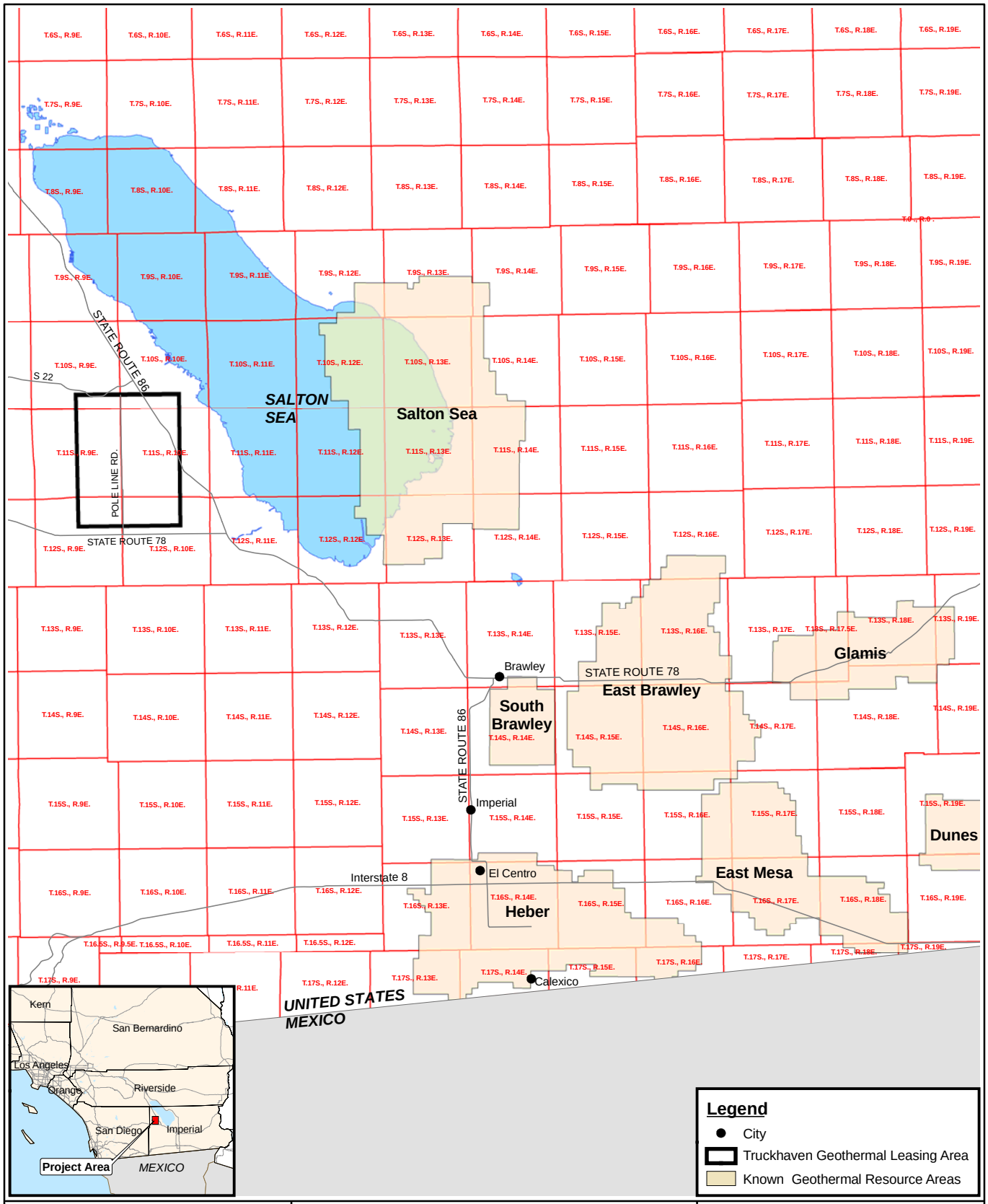
(e) Fish hatcheries or wildlife management areas administered by the Secretary;

(f) Indian trust or restricted lands within or outside the boundaries of Indian reservations;

(g) The Island Park Geothermal Area; and

(h) Lands where Section 43 of the Mineral Leasing Act (30 U.S.C. 226-3) prohibits geothermal leasing, including:

(1) Wilderness areas or wilderness study areas administered by BLM or other surface management agencies;



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TRUCKHAVEN GEOTHERMAL LEASING AREA

FINAL EIS

Figure 1-2
KGRAs

Job Id:

Date: 12/28/2006

GIS Analyst: avh

Map Source Information:

(2) Lands designated by Congress as wilderness study areas, except where the statute designating the study area specifically allows leasing to continue; and

(3) Lands within areas allocated for wilderness or further planning in Executive Communication 1504, Ninety-Sixth Congress (House Document 96-119), unless such lands are allocated to uses other than wilderness by a land and resource management plan or are released to uses other than wilderness by an Act of Congress.

No specific areas within the Truckhaven Geothermal Leasing Area were closed to geothermal leasing in the CDCA Plan. The analysis in this Final EIS may identify timing and location restrictions for future surface use within leased areas.

Lease applications, in accordance with provisions of the Geothermal Steam Act, are generally submitted for at least one full section of land, which is a mapped area of 1 square mile or 640 acres. As a result, while lease applications may be submitted for more than one section, and while applications may be approved for less than one section, the section is the basic geographic unit for analysis in this EIS.

1.2 Location of the Proposed Action

The Truckhaven Geothermal Leasing Area, also referred to as the proposed action area or Truckhaven, is located adjacent to the Salton Sea in western Imperial County, California (Figure 1-3). It is within the boundaries of the CDCA and includes portions of the Ocotillo Wells State Vehicular Recreation Area (OWSVRA) owned by Federal government and managed by the State for recreational use under a Memorandum of Understanding with the BLM (Appendix D).

As of September 1, 2006, five noncompetitive lease applications, covering approximately 7,051 acres, were filed with BLM for geothermal resources within the Truckhaven Geothermal Leasing Area. The BLM manages approximately 14,731 acres of land at Truckhaven that are currently unleased. This Final EIS considers leasing for all BLM-managed geothermal resources at Truckhaven (Figure 1-1) for both competitive and noncompetitive leasing. Additionally, the Truckhaven Geothermal Leasing area includes approximately 23,680 acres of private lands (320 acres of which have federally owned geothermal resources). Within the Truckhaven area, the California State Lands Commission (CSLC) has fee ownership of approximately 1,189 acres located in Section 4, T.11S., R10E. and Section 10, T.11S., R10E., San Bernardino Meridian (SBM).

Other State-owned lands include those under the jurisdiction of the California Department of Parks and Recreation or Caltrans along Highway 86. In terms of lands within Truckhaven Geothermal Leasing Area where the geothermal resources are owned by or reserved to the State, there are approximately 4,817 acres where leasing would fall to the CSLC. If geothermal activities are proposed in the future for the non-Federal lands within the project area, a subsequent environmental document meeting the requirements of the California Environmental Quality Act (CEQA) may be required by the County of

Imperial Planning and Development Services or by State agencies. (Additional resource studies would also be undertaken prior to leasing on State lands, including those regarding special status species and cultural resources.)

1.3 Purpose of the Action

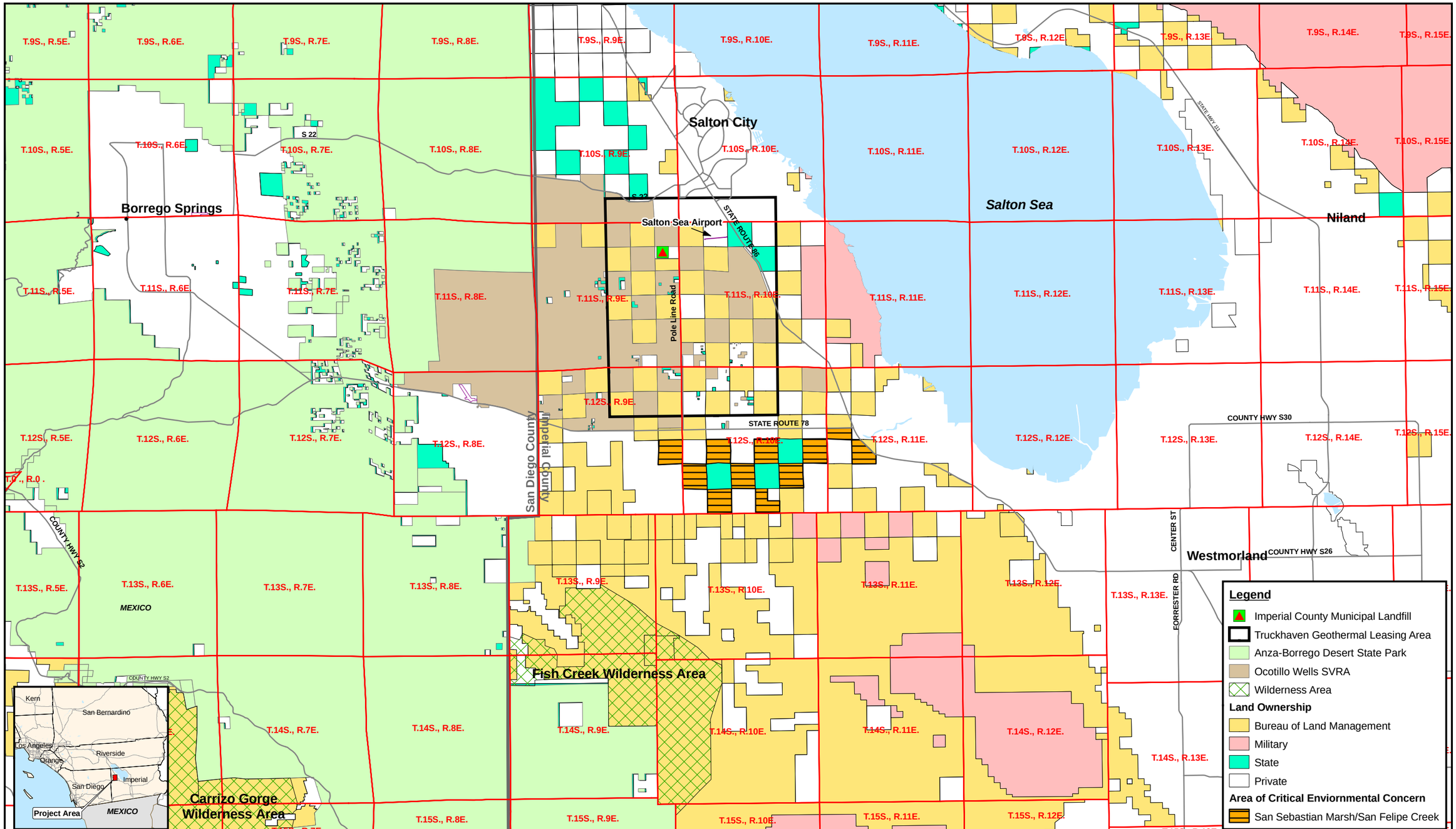
The purpose of the proposed action is to (1) determine whether to approve leases for Federal geothermal resources on public lands with pending noncompetitive lease applications in the Truckhaven Geothermal Leasing Area, and (2) determine whether to offer competitive leases for Federal geothermal resources on public lands in the Truckhaven Geothermal Leasing Area that do not have pending lease applications.

1.4 Need for the Action

The need for Federal action arises from pending applications, national policy, and Congressional direction. There are five pending applications for noncompetitive leases of geothermal resources in the Truckhaven Geothermal Leasing Area. These lease applications were filed in 2000 and 2001. The National Energy Policy, released in May 2001, directed "[T]he Secretary of the Interior to determine ways to reduce the delays in geothermal lease processing as part of the permitting review process." On May 18, 2001, President Bush issued Executive Order 13212, Actions to Expedite Energy-Related Projects, which states, "[T]he increased production and transmission of energy in a safe and environmentally sound manner is essential." Executive departments and agencies are directed to "take appropriate actions, to the extent consistent with applicable law, to expedite projects that will increase the production, transmission, or conservation of energy." Executive Order 13212 further states, "(f)or energy-related projects, agencies shall expedite their review of permits or take other actions as necessary to accelerate the completion of such projects, while maintaining safety, public health, and environmental protections. The agencies shall take such actions to the extent permitted by law and regulation, and where appropriate." Additionally, the Energy Policy Act of 2005 (Public Law 109-58) made significant changes to the Geothermal Steam Act of 1970, as amended, to encourage the leasing and development of geothermal resources from public lands.

Although this is a Federal action taking place on Federal land, the proposed action also meets one of California's Renewables Portfolio Standard Program goals, which calls for 20 percent of California's energy to be from renewable sources by 2010. (By comparison, as of 2004, 10.4 percent of California's electric production came from renewable energy sources (CEC 2007).

The California State Lands Commission (CSLC) has received applications for prospecting permits pursuant to Public Resources Code section 6910, and a nomination pursuant to Public Resources Code section 6911 & 2 C.C.R. § 2249 requesting the Commission to conduct a competitive lease sale, each covering geothermal resources underlying lands within the Truckhaven Geothermal Leasing Area. The CSLC intends to



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Map Reference: California Bureau of Land Management

TRUCKHAVEN GEOTHERMAL LEASING AREA

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Figure 1-3
VICINITY MAP

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use this document as the basis for preparing a programmatic Environmental Impact Report (EIR) under the California Environmental Quality Act (CEQA) for the potential issuance of State leases for geothermal resources on areas where the CSLC has jurisdiction over mineral interests. Any specific exploration or production activities involving surface disturbance proposed in the future would be subject to further review under the CEQA and approval by the Commission.

1.5 Relationship to BLM Policies, Plans, and Programs

The U.S. Department of the Interior's policy, consistent with Section 2 of the Mining and Mineral Policy Act of 1970 and Sections 102(a)(7), (8), and (12) of the FLPMA, encourages the development of mineral resources, including geothermal resources, on Federal lands. The Geothermal Steam Act of 1970 (43 CFR 3200 et seq.), discussed in Section 1.1, "Background for Geothermal Resources and Leasing," provides regulatory guidance for geothermal leasing by BLM.

Geothermal resources leasing is subject to a number of Federal, State, and local laws, regulations, and plans. The following section summarizes the most pertinent Federal and State policies, plans, and laws that are considered in the analysis of this EIS.

1.5.1 Federal Land Policy and Management Act of 1976

The FLPMA is important in several key ways for this proposal. It provides BLM's overarching mandate to manage the public lands and resources under its stewardship under the principles of multiple use and sustained yield. Multiple use is a concept that directs management of public lands and their resource values in a way that best meets the present and future needs of Americans, and defined as:

> a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources (FLPMA Section 103(c)).

Sustained yield is defined as:

> the achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the public lands consistent with multiple use (FLPMA Section 103(h)).

FLPMA directs BLM to manage sustained yield consistent with multiple use.

For the CDCA, FLPMA Section 601 required BLM to develop a land use plan to determine appropriate uses of the CDCA:

> The Secretary of the Interior . . . shall prepare and implement a comprehensive, long-range plan for the management, use, development, and protection of the public lands within the California Desert Conservation Area. Such plan shall take into account the principles of multiple use and development, including, but not

> limited to, maintenance of environmental quality, rights-of-way, and mineral development. Such plan shall be completed and implementation thereof initiated on or before September 30, 1980.

The CDCA Plan, as amended, identified this area as provisionally available for mineral leasing in 1980 (USDI BLM 1999). The lands were not open to leasing until BLM completed additional environmental analysis such as this EIS. (See Section 1.6.9 for more information on the CDCA Plan.)

1.5.2 National Environmental Policy Act

The NEPA requires Federal agencies to review the effects of its actions on the natural and human-made environment prior to taking action. The review process helps not only Federal officials but also the public understand the environmental consequences of major projects and actions that protect, restore, and enhance the environment. This law requires all Federal actions that could result in a significant impact on the environment to be subject to review by Federal, Tribal, State, and local environmental authorities as well as by affected parties and interested citizens.

1.5.3 Clean Air Act

The Clean Air Act (CAA), as amended, regulates air pollution to improve air quality. This Act regulates air emissions from area, stationary, and mobile sources. This law also authorizes the U.S. Environmental Protection Agency to establish National Ambient Air Quality Standards to protect public health and the environment.

1.5.4 Clean Water Act

The Clean Water Act regulates discharges of pollutants into the waters of the United States. Also included are requirements to set water quality standards for all contaminants in surface waters. The Clean Water Act makes it unlawful for any person to discharge any pollutant from a point source into navigable waters unless a permit is obtained under its provision.

1.5.5 Geothermal Steam Act of 1970

The Geothermal Steam Act, as amended, governs the leasing of geothermal steam and related resources on public lands. This Act authorizes the Secretary of the Interior to issue leases for development of geothermal resources and also prohibits the leasing on a variety of public lands, such as those administered by the U.S. Fish and Wildlife Service.

1.5.6 Energy Policy Act of 2005

The Energy Policy Act established a comprehensive, long-range national energy policy. It provides incentives for traditional energy production as well as newer, more efficient energy technologies and conservation. It contains several provisions related to geothermal energy to make it more competitive with traditional methods of energy production. It also amended the Geothermal Steam Act in several ways, which are discussed throughout the EIS.

1.5.7 Endangered Species Act

The Endangered Species Act of 1973, as amended, provides for the Federal protection of threatened plants, insects, fish, and wildlife. The U.S. Fish and Wildlife Service administers the Endangered Species Act on behalf of the United States. The major components of the Act include:

(1) Provisions for the listing of threatened and endangered species.

(2) The requirement for consultation with the U.S. Fish and Wildlife Service on Federal projects.

(3) Prohibitions against the taking of listed species.

(4) Provisions for permits to allow the incidental taking of threatened and endangered species.

1.5.8 National Historic Preservation Act of 1966, as Amended

The National Historic Preservation Act of 1966 (Public Law 89-665, as amended by Public Law 96-515; 16 U.S.C. 470 et seq.) provides for the establishment of the National Register of Historic Places (NRHP) to include historic properties such as districts, sites, buildings, structures, and objects that are significant in American history, architecture, archaeology, and culture. Section 106 of the Act requires Federal agencies with jurisdiction over a proposed Federal project to take into account the effect of the undertaking on cultural resources listed or eligible for listing on the NRHP, and afford the State Historic Preservation Office and the Advisory Council on Historic Preservation an opportunity to comment regarding the undertaking. The NRHP eligibility criteria have been defined by the Secretary of the Interior's Standards for Evaluation (36 CFR 60).

1.5.9 California Desert Conservation Area Plan

The CDCA encompasses 25 million acres of land in Southern California designated by Congress in 1976 through the FLPMA. The BLM directly administers about 10 million acres of the CDCA, which includes the Truckhaven Geothermal Leasing Area. With the designation of the CDCA, Congress directed the BLM to prepare and implement a comprehensive, long-range plan for the management, use, development, and protection of public lands within the CDCA. The 1980 CDCA Plan, as amended, is based on the concepts of multiple use, sustained yield, and maintenance of environmental quality. The CDCA Plan provides overall regional guidance for management of the public lands in CDCA and establishes long-term goals for protection and use of the California Desert. The CDCA Plan establishes four multiple use classes. Multiple use class guidelines, and plan elements for specific resources or activities such as motorized-vehicle access, recreation, and vegetation. These multiple use classes are:

- Class C (Controlled Use): About 4 million acres are Class C. These include 69 wilderness areas, totaling 3,667,020 acres created by Congress with the October 1994 passage of the California Desert Protection Act. These lands

are to be preserved in a natural state; access generally is limited to non-motorized, non-mechanized means (i.e., by foot or horseback).

- Class L (Limited Use): About 4 million acres are Class L. These lands are managed to protect sensitive, natural, scenic, ecological, and cultural resource values. They provide for generally lower-intensity, carefully controlled multiple uses that do not significantly diminish resource values.

- Class M (Moderate Use): About 1.5 million acres are Class M. These lands are managed in a controlled balance between higher-intensity use and protection. A wide variety of uses such as mining, livestock grazing, recreation, energy, and utility development are allowed. Any damage that permitted uses cause must be mitigated.

- Class I (Intensive Use): About 500,000 acres are Class I. These lands are managed for concentrated use to meet human needs. Reasonable protection is provided for sensitive natural values, and mitigation of impacts and rehabilitation of impacted areas will occur when possible.

The Truckhaven Geothermal Leasing Area is designated "Class M" or moderate use under the CDCA Plan.

The proposed action conforms with the Geology-Energy-Minerals (G-E-M) resource elements of the CDCA Plan. It is also consistent with other Federal, State, and local laws, regulations, and plans to the maximum extent possible. The CDCA Plan states that the general goals for G-E-M resources are:

(1) Within the multiple-use management framework, assure the availability of known mineral resource lands for exploration and development.

(2) Encourage the development of mineral resources in a manner which satisfies national and local needs, and provides for economically and environmentally sound exploration, extraction, and reclamation processes.

(3) Develop a mineral resource inventory, G-E-M database, and professional, technical, and managerial staff knowledgeable in mineral exploration and development.

The CDCA further states that specific objectives of the element are:

(1) Continue to recognize ways of access and opportunities for exploration and development on public lands assessed to have potential for critical mineral resources, minerals of national defense importance, minerals of which the U.S. imports 50 percent or more, and minerals of which the U.S. is a net exporter.

(2) Continue to recognize ways of access and opportunities for exploration and development on public lands assessed to have potential for energy mineral

resources. These are geothermal, oil, gas, uranium, and thorium, considered to be paramount priorities both nationally and within the State of California.

The Western Colorado Desert Route of Travel Plan amended the CDCA Plan to designate open, limited, and closed trails across the western part of the CDCA, including lands at Truckhaven (USDI BLM 2003c).

1.6 Other Plans and Programs

The plans and programs discussed below are directly or indirectly applicable to the planning process at Truckhaven.

1.6.1 State of California Renewables Portfolio Standard Program

The California Renewables Portfolio Standard Program is a State law requiring investor-owned utilities to obtain 20 percent of the power supplied to customers to be generated from renewable resources by 2010. These renewable resources include wind, geothermal, and solar generation.

1.6.2 State Implementation Plan for PM_{10} in the Imperial Valley, Executive Summary, Final (1993)

The Truckhaven area falls within the Salton Sea Air Basin, which is classified as a nonattainment area for respirable particulate matter with a diameter less than 10 micrometers (PM_{10}) based on Federal CAA standards. This Final EIS considers the impact (if any) that geothermal leasing and any potential subsequent development would have on these and other CAA standards.

1.6.3 County of Imperial General Plan (2003)

This plan seeks to direct growth, particularly urban development, to suitable areas in Imperial County. The plan is divided into nine elements and includes a land use map that designates land use categories and locations. Included in the nine elements is a section on geothermal and transmission, given Imperial County's vast geothermal resources. This section discusses county goals, plans, and standards to facilitate the development of geothermal resources. Any geothermal development will require a General Plan Amendment and zoning change to "Geothermal Overlay Zone." Development must be consistent with the Land Use Ordinance. The possible expansion of water and sewer lines by the Coachella Valley Water District and/or Salton Community Services District may require a Local Agency Formation Commission review and approval of their Service Area Plan and Special District boundaries (Imperial County 2007).

1.6.4 Flat-Tailed Horned Lizard Range-Wide Management Strategy (2003)

The 2003 revision of the Flat-Tailed Horned Lizard Range-Wide Management Strategy provides guidance for the conservation and management of sufficient habitat to maintain existing populations of flat-tailed horned lizards within five management areas located only on BLM-managed public lands within Imperial County (Flat Tailed Horned Lizard

Interagency Coordinating Committee 2003). The Ocotillo Wells Research Area, an area where scientific studies on this species are encouraged by the BLM, was also established to support research in an active off-highway vehicle recreation area. The subject lands associated with the proposed action are within this research area.

1.6.5 West-wide Energy Corridor Programmatic EIS (2006)

The U.S. Department of Energy, the BLM, the USDA Forest Service, and U.S. Department of Defense are preparing a Programmatic EIS to evaluate issues associated with the designation of energy corridors on Federal lands in 11 western states. Based on the information and analyses developed in this Programmatic EIS, each agency would amend its respective land use plans by designating a series of energy corridors. One of the proposed corridors would accommodate electric transmission lines that would bring electricity produced at the Truckhaven Geothermal Leasing Area to market, although there are none within Truckhaven itself.

Chapter 2

Proposed Action and Alternatives

2.0 Introduction

This chapter discusses the proposed action and a reasonable range of alternatives. It also includes a summary of the Bureau of Land Management's (BLM's) reasonably foreseeable development (RFD) scenario for development of geothermal energy at the Truckhaven Geothermal Leasing Area.

Based on issues, concerns, and opportunities identified from public scoping comments, interdisciplinary interaction between resource professionals, and collaboration with interested agencies, the BLM identified a range of alternatives. Three alternatives are studied in detail: Alternative 1 – No Action (No Leasing); Alternative 2 – Address Only Pending Noncompetitive Lease Applications; and Alternative 3 (Proposed Action) – Lease All BLM-managed Geothermal Resources.

Both of the action alternatives meet the purpose and need statement found in Chapter 1 by addressing the outstanding noncompetitive lease applications, and meeting national energy policy, Congressional direction and the Federal Land Policy and Management Act.

As discussed in Section 2.2, Reasonably Foreseeable Development scenario, development of geothermal resources would likely take place over several years. If a developable resource is found, two to three wells would likely be drilled and a small power plant constructed. Over time, if the Truckhaven area is determined to contain a larger economically viable resource, more wells and more capacity would be added. Under the maximum expected development scenario, there would be as many as 50 wells (25 production and 25 reinjection) drilled and two 25 megawatt (MW) (net) power plants built.

2.1 Alternatives

2.1.1 Alternative 1 – No Action Alternative (No Leasing)

Under the No Action Alternative, BLM would not approve the existing noncompetitive lease applications or offer any other lands for leasing. No geothermal energy leases have been issued to date for the Truckhaven Geothermal Leasing Area.

2.1.2 Alternative 2 – Address Only Pending Noncompetitive Lease Applications

Under Alternative 2, BLM would offer the 11 sections of land with pending geothermal noncompetitive lease applications for leasing (Table 2-1).

The geothermal leases would be subject to the standard stipulations. Implementation of certain stipulations would be subject to mitigation measures, such as the best management practices (BMPs) outlined in Section 2.1.5, Features Common to Action Alternatives. These BMPs are designed to reduce or eliminate impacts to various resources and uses from exploration and development that may occur as a result of leasing. Site-specific measures would be developed as part of future site-specific analysis and permitting conditions at the time of subsequent proposed exploration, development, or utilization activities. Additional mitigation measures would be developed as part of future site-specific analyses and permitting considerations covering subsequent proposed exploration, development, or utilization activities.

Table 2-1 Lands Considered for Geothermal Leasing

Township/Range (SBM.)	Section	Lease Applicant	BLM Serial No.	Acreage
Truckhaven Geothermal Noncompetitive Lease Areas				
11S 9E	2	Layman	43003	640
11S 9E	12	Layman	43003	640
11S 10E	6	Mack	42750	640
11S 10E	8	Mack	42750	640
11S 10E	28	Mack	42752	640
11S 10E	30	Mack	42752	640
11S 10E	32	Mack	42752	640
11S 10E	34	Mack	42751	640
12S 10E	4	Mack	42751	640
12S 10E	6	Mack	42751	640
11S 10E	18	Ormat	43002	651
Total Noncompetitive Leasing Area				7,051
Truckhaven Geothermal Competitive Lease Areas				
11S 9E	10, 14, 22, 24, 26	N/A	N/A	2,560
11S 10E	20, 22	N/A	N/A	1,920
12S 9E	2, 10, 12	N/A	N/A	1,920
12S 10E	8, 10	N/A	N/A	1,280
Total Competitive Leasing Area				7,680
Total BLM Managed Geothermal Resources				14,731

Note: N/A = not applicable.

2.1.3 Alternative 3 (Proposed Action) – Lease All BLM-managed Geothermal Resources

Under Alternative 3, BLM would approve leases for tracts with pending noncompetitive leasing applications at the Truckhaven Geothermal Leasing Area filed between 2000 and 2001 and offer competitive leases for all other Federal mineral resources at Truckhaven totaling 14,731 acres (Table 2-1).

The geothermal leases would be subject to the standard stipulations. Implementation of certain stipulations would be subject to mitigation measures, such as the BMPs outlined in Section 2.1.5, Features Common to Action Alternatives. These BMPs are designed to

reduce or eliminate impacts to various resources and uses from exploration and development that may occur as a result of leasing. Site-specific measures would be developed as part of future site-specific analysis and permitting conditions at the time of subsequent proposed exploration, development, or utilization activities.

2.1.4 Alternatives Considered but Eliminated from Further Analysis

During scoping, members of the public voiced concern regarding the impact of geothermal development to off-highway vehicle recreation in the area and offered the following two alternatives to reduce these potential impacts. These alternatives are described below:

State Land Acquisition to Mitigate Impacts to Recreation

As mitigation for geothermal project development, an alternative requesting 1:1 compensation for impacted recreation lands by means of the acquisition and donation of lands to the State Parks system was considered. This alternative was eliminated from detailed analysis because the mitigation measure was determined to not be feasible. BLM has no authority to require the donation of land to the State of California. Additionally, an acre-for-acre acquisition for all ground-disturbing activities associated with geothermal development would be cost-prohibitive to potential operators, thus resulting in no development which would not meet the purpose and need of the project. The impacts associated with no development are analyzed in the No Action Alternative.

BLM Land Use Plan Changes to Mitigate Recreation Impacts

An alternative amending current land use plans to open additional areas to off-highway vehicle recreation was determined to not meet the purpose and need for this project, be beyond the scope of this project, and not be warranted at this time. Changing a BLM land use plan decision to provide additional recreation opportunities is not an appropriate lease stipulation because it is not within a lessee's authority to change a BLM land use plan. Presupposing the need for a future change based on the potential for a change in circumstances does not present a compelling case for reconsideration of current planning decisions. BLM believes that the standard lease stipulations and the general and specific mitigation measures in Section 2.1.5 are adequate to reduce or eliminate conflicts with motorized recreation uses. BLM has sufficient authority to impose these measures as conditions of approval at the exploration and development stages without the need for land use plan changes.

If the decision is made to issue geothermal leases on federal lands within the Truckhaven Geothermal Leasing Area, geothermal activities and facilities, if developed, could preclude OHV use from some lands. In light of this concern, it is important to consider the amount of land that may, at full geothermal development, be excluded from OHV use, compared to the acreage within the overall Truckhaven Geothermal Leasing Area. Based upon the Reasonably Foreseeable Development scenario discussed in the in Section 2.2 on page 2.10, approximately 502 acres could conceivably be initially disturbed by geothermal facilities if development reached the estimated 50 MW (net) capacity of the reservoir. The impact would be the result of the footprint caused by the

construction of dirt roads, pipelines, wellpads, transmission lines and two powerplants. Assuming that full development to 50 MW (net) occurs, the footprint of approximately 502 acres is less than two percent of the entire 40,320 acres of the Truckhaven Geothermal Leasing Area. After construction of the facilities, about 97 acres would be reclaimed.

Of the 405 acres disturbed for geothermal development, 180 acres would be for access roads which would be open to OHV use. In essence, the actual impact from the presence of geothermal wells, pipelines, and the two powerplants, if developed, would probably cover less than 220 acres within the entire Truckhaven Geothermal Leasing Area. The long term utilization of approximately 220 acres at full field development would be less than 1% of the entire surface area within Truckhaven Geothermal Leasing Area. Given the mitigation measures outlined in Chapter 2, the actual loss of OHV routes would be much less and potentially zero, As a result, no mitigation, such as land compensation, is proposed for an impact that could affect less than one percent of the Truckhaven Geothermal Leasing Area.

2.1.5 Features Common to Action Alternatives

Mitigation Measures and Best Management Practices

Geothermal resource leases are subject to the standard stipulations and lease terms. The current terms, which are subject to change, are found on Form 3200-24 (Appendix A). The right to explore, develop, and utilize leased geothermal resources is inherent in the lease, subject to stipulations, legal requirements, and terms and conditions on permits. Specific conditions of approval and other mitigation measures would be required during subsequent authorizations. These include timing and location of activities during the development phases (see Section 2.2, Reasonably Foreseeable Development scenario). In addition, BLM and other governmental agencies may require specific permits.

To minimize adverse impacts to resources and uses in the proposed action area, the following BMPs and mitigation measures would be included or considered in Plans of Operation, which are required for surface-disturbing activities. The BMPs provide guidance for lessees on how to meet Section 6 of the standard lease terms for this project area. Depending on site-specific conditions and individual development plans, the following BMPs and mitigation measures may be required. Others could be identified during site-specific analyses.

General

These BMPs would help reduce or eliminate impacts to multiple elements of the human environment. Many BMPs would also minimize operator costs.

- Centralize production facilities;
- Bury distribution power lines in or adjacent to access roads;
- Use common utility or rights-of-way corridors, where practicable;

- Conduct interim reclamation of disturbed areas not needed for operation;
- Recontour all disturbed areas in final reclamation to original contours or to contours which blend with the surrounding topography;
- Revegetate reclaimed areas to restore the area to the original vegetative species composition (including annual plant seed bank, which includes several sensitive species); and/or
- Use or improve existing roads to minimize new construction.

Air Quality

- Fugitive dust emissions from roads would be mitigated by periodic watering.

Noise

- The power plants would be sited using terrain to further shield noise impacts to the greatest extent possible.
- Whenever reasonably possible, geothermal well drilling or major facility construction operations proposed within 1,000 feet of the OWSVRA boundary would be restricted to non-sleeping hours (7:00 am to 10:00 pm), or appropriate, reasonable methods would be employed to limit the hourly average noise levels at the OWSVRA to 60 dBA or below. If this is not reasonably possible, the geothermal lessee would provide at least a one-month notice to the OWSVRA manager of the date scheduled and location of the proposed operation so the California Department of Parks and Recreation can provide and post notice within the OWSVRA of the proposed activity. For unscheduled (emergency) operations, the geothermal lessee would immediately contact the OWSVRA manager so the California Department of Parks and Recreation can provide appropriate notice to the adjacent OWSVRA users.

Topography, Geology, Geological Hazards

- A detailed geotechnical analysis would be performed prior to the construction of any structures so they could be sited to avoid any hazards from subsidence or liquefaction (i.e., the changing of a saturated soil from a relatively stable solid state to a liquid during earthquakes or nearby blasting).

Fish and Wildlife

- Above ground pipelines would be insulated.

- All pipelines outside of a power plant site or other fenced areas would be elevated at least 12 inches (0.3 meters) above the ground surface to allow wildlife mobility and prevent interference with natural drainage.

Special Status Species

- Where feasible, vehicles would use existing roads. Before new drilling pads or other land disturbance is conducted, surveys of the affected areas would be conducted to identify any special status species populations to be avoided in the area.

Cultural Resources

- Before any specific permits are issued under leases, treatment of cultural resources would follow the procedures established by the Advisory Council on Historic Preservation for compliance with Section 106 of the National Historic Preservation Act.

- A pedestrian inventory would be undertaken of all portions that have not been previously surveyed or are identified by BLM as requiring inventory to identify properties that are eligible for the National Register of Historic Places.

- Those sites not already evaluated for National Register of Historic Places eligibility would be evaluated based on surface remains, subsurface testing, archival, and/or ethnographic sources. Subsurface testing would be kept to a minimum whenever possible if sufficient information is available to evaluate the site or if avoidance is an expected mitigation outcome.

- Recommendations regarding the eligibility of sites would be submitted to the BLM, and a treatment plan would be prepared to detail methods for avoidance of impacts or mitigation of effects. The BLM would make determinations of eligibility and effect and consult with the State Historic Preservation Office as necessary based on each proposed lease application and project plans.

- Avoidance of impacts through project design would be given priority over data recovery as the preferred mitigation measure. Avoidance measures include moving project elements away from site locations or to areas of previous impacts, restricting travel to existing roads, and maintaining barriers and signs in areas of cultural sensitivity. Any data recovery will be preceded by approval of a detailed research design, Native American consultation, and other requirements for BLM issuance of a permit under the Archaeological Resources Protection Act.

Visual Resources

- Power plants would be sited using terrain to obstruct visual impacts to the extent possible.
- All facilities, including geothermal production and injection pipelines, wellheads, powerplants, maintenance buildings, etc. would be painted a color that blends into the natural setting.

Human Health and Safety/Hazardous Materials

- Potential geothermal development would be constrained by the obstruction standards in Federal Aviation Administration regulations relating to objects affecting navigable airspace surrounding the Salton Sea Airport (per 14 CFR 77 Subpart C). These regulations allow for waivers issued by the Federal Aviation Administration. Other sections affected by the restrictions are on private or State lands.
- Mitigation measures for hazardous materials generated by geothermal exploration and development would be specified in authorized use permits and would require the responsible party to take corrective actions(s) as required to comply with Federal, State, and local regulations.

Recreation

- Facilities, including pipelines, power lines, and power production facilities, would be placed to avoid crossing or blocking existing off-highway vehicle routes, or be buried under routes if avoidance is not possible.

2.1.6 Construction Design Measures

Air Quality

- Hydrogen sulfide emissions would be abated, for example, through the injection of hydrogen peroxide and sodium hydroxide into the test line.

Soils

- Prior to geothermal exploration and development, a complete subsurface geotechnical investigation would be conducted to analyze the soil and geologic conditions. The investigation would evaluate and identify potential geologic hazards and would provide remedial grading recommendations, foundation and slab design criteria, and soil parameters for the design of geothermal power infrastructure. The following standard construction measures would be implemented as part of geothermal exploration and development:

- Standard soil and geotechnical engineering investigations would be conducted to ensure foundation stability.
- Before on-site grading, an erosion control plan would be prepared by an erosion control specialist certified by the International Erosion Control Society to adequately control erosion during construction.
- Proposed fill slopes would be no steeper than 2:1 (horizontal to vertical). Proposed cut slopes would be determined by soil characteristics.
- Safe allowable slope heights would generally be limited by the shear strength characteristics of the particular soil or rock conditions present.
- Grading would be performed so all identified compressible materials would be removed and recompacted, and fill soils would be placed and compacted to at least 90 percent relative compaction.
- All graded pads would have drainage swales to direct stormwater runoff or irrigation runoff away from structures or the tops of slopes to control drainage facilities. No stormwater would be allowed to discharge over the top of cut or fill slopes.
- If perched groundwater were identified as a potential concern during the subsurface investigation, canyon sub-drains would be installed after alluvial removal and before the fill placement.

Water Resources

- Proposed geothermal exploration and development would comply with the Clean Water Act as implemented by the State Water Resources Control Board's National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, a general permit for construction activities, and the associated Order No. 92-08-DWQ, Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction Activity. Projects of 1 acre or more are subject to this general construction permit process.
- Developers would be required to eliminate or reduce non-stormwater discharges to stormwater systems, develop a Stormwater Pollution Prevention Plan (SWPPP) prior to beginning construction, inspect all stormwater control structures, and implement other pollution prevention measures, such as applicable BMPs and conservation measures during construction.
    - The SWPPP would include the specific measures and techniques for implementation to protect the project sites and adjacent areas from erosion and deposition during site grading, construction, and post-construction stabilization of sediment on the site.

- The contractor would provide a copy of the SWPPP for the various crews performing work on the construction site, and a copy would be kept on-site during the project to satisfy the requirements of the NPDES permit. A draft of this SWPPP would be forwarded to the BLM for review prior to its finalization.

Because construction crews would comply with the SWPPP contained in the NPDES permit process, the risk associated with increased erosion potential would be low and would not be considered adverse.

Recreation

- Any necessary temporary route closures for construction would be coordinated with BLM and Ocotillo Wells State Vehicular Recreation Area (OWSVRA) before beginning construction.

- Signs directing vehicles to alternative park access and parking would be posted in the event construction temporarily obstructs parking areas near trailheads.

- Signs and/or flagging that advise recreational users of construction activities would be posted in coordination with BLM and OWSVRA. Whenever active work is being performed, the area should be posted with "construction ahead" signs on any adjacent access roads or trails that might be affected.

- Construction-related traffic would be restricted to routes approved by the authorized agency(ies). Construction of new access roads or cross-country vehicle travel would not be permitted unless prior written approval is given by the authorized officer. Authorized roads used by the proposed action will be rehabilitated when construction activities are complete. The agency(ies) would work with the proponent to develop site-specific standards for route reconstruction.

- Whenever possible, construction activities would be avoided during high recreational use periods.

Transportation and Traffic

The following measures would be considered during implementation to minimize traffic safety issues. With the incorporation of these measures, no significant impacts to the local roadway systems would occur.

- The lessee would be required to file a traffic control plan indicating how and where construction traffic would be routed and traffic control measures would be emplaced to ensure accidents do not occur.

- Signs directing vehicles to alternative park access and parking would be posted in the event construction temporarily obstructs recreational parking areas near trailheads.

- Signs and/or flagging that advise recreational users of construction activities would be posted in coordination with BLM and/or OWSVRA. Whenever work is being performed, the area would be posted with "construction ahead" signs on any adjacent access roads or trails that might be affected.

- Construction-related traffic would be restricted to routes approved by the authorized agency(ies) (BLM, OWSVRA).

- Whenever possible, construction activities would be avoided during high recreational use periods.

2.2 Reasonably Foreseeable Development Scenario

To estimate potential impacts from leasing geothermal resources in the Truckhaven area, BLM has prepared an RFD scenario. As the name implies, the level and type of development anticipated in the RFD scenario is a best professional estimate of what may occur if these areas are leased. It is not intended to be a maximum development scenario; instead, it is biased towards the higher end of expected development.

The foreseeable development described here could occur on any land within the Truckhaven Geothermal Leasing Area, which encompasses 63 sections on approximately 40,320 acres, regardless of surface or mineral ownership. Of these 40,320 acres, approximately 22.5 sections (14,731 acres) are BLM surface and subsurface, 320 acres are private surface/Federal minerals, and the remainder is State or privately owned land. Of the BLM land, pending geothermal lease applications cover 11 sections (7,051 acres).

The RFD scenario considers that development could occur throughout the entire 40,320 acres. However, as will be discussed below and throughout the EIS, surface-disturbing activities would occur on only a fraction of the total area. Under Alternative 2 – Address Only Pending Noncompetitive Lease Applications, BLM would consider leasing only the 11 sections with current noncompetitive lease applications (7,051 acres).

However, in order to capture enough of the geothermal resource at Truckhaven to produce energy in economically viable quantities, the RFD scenario found that lands in addition to the Federal tracts would be needed. Under Alternative 2, these additional geothermal resources would be extracted from adjacent State or private lands; decisions regarding the leasing of these resources are not considered in this EIS. These non-BLM lands include seven sections (totaling approximately 4,344 acres) of State-owned surface and subsurface and another 473 acres of private surface/State minerals. Under Alternative 3 – Lease All BLM-managed Geothermal Resources, the rest of the BLM – managed mineral estate at Truckhaven would be leased, which would provide all of the necessary land and geothermal resources to develop two 25-MW (net) power plants.

2.2.1 Initial Development

Since land ownership in the Truckhaven area may incorporate various permitting processes that depend on the specific land status and the laws/regulations, the time frames and progression of exploration and development may vary.

To begin with, an operator in this area would most likely obtain a Power Purchase Agreement (PPA) from a utility before proposing any exploration involving drilling wells to test and confirm the presence of the geothermal resource. The PPA would specifically identify the amount and date of delivery of the electricity, probably in megawatts, that the operator proposes to sell to the utility's grid. For the RFD, it is assumed that the lessee/operator would obtain one 25-MW PPA, and have an option for another 25-MW PPA upon the successful development and delivery of the first 25 MW.

With a 25-MW PPA, two or three deep exploration wells would be drilled within the Truckhaven area to obtain sufficient reservoir data of the extent of the geothermal resource at depth. After submitting the necessary drilling permit applications to the appropriate land management agencies, completing the necessary environmental analysis that addresses the drilling of two wells, and receiving approval by the agencies, the operator would begin the preparation to drill. Due to the cost of renting drilling rigs, and due to the demand for such rigs elsewhere for oil and gas exploration, probably only one well would be drilled at a time. Preparing the two drilling pads and access roads to the same may take several weeks to complete. Once completed, the drilling rig and ancillary equipment would be brought onto the drilling pad with initial drilling of the first exploration well commencing several days later.

Assuming normal drilling operations, the drilling rig would be on the well pad for about two months in order to complete the drilling down to a depth of about 5,000 feet. At the end of the drilling phase, the operator would test the well by flowing the geothermal resources to the surface into a sump or rented tanks to obtain data on the temperature, pressure, and water chemistry of the geothermal resources. Flow testing, with the drilling rig still on site, may take a week or more to obtain the necessary data. When completed, and assuming a successful well, the drilling rig would be moved to the second of the two approved exploration drilling sites. The second well would probably be drilled in the same manner and take a similar length of time, two months, to complete.

Upon completion of the second well, the operator would conduct additional well testing by flowing the geothermal resource from one well to the other well via a hand laid irrigation type metal pipeline. This phase of well testing would take up to a month to complete. During this time, the operator would evaluate the capability of the geothermal reservoir to produce sufficient energy to supply a 25-MW binary power plant. Upon completion of this flow test, the operator may choose to drill one or two additional wells to further define the capability of the reservoir, or the operator may take the necessary steps to prepare an overall geothermal drilling, development and utilization plan describing a proposed 25-MW binary facility and accompanying well pads, roads, pipelines, and electrical transmission lines. The submission of this permitting package to the appropriate land management agencies would most likely result in the preparation of

an EIS. If State lands are also included in the field development, a joint EIS/Environmental Impact Report (EIS/EIR) would be prepared with the California State Lands Commission to address the impacts of the proposed 25-MW facility, new well field, roads and transmission line on the area. This environmental review process would take a minimum of 12 months and could conceivably take longer, depending on the level of potential impacts identified in the document and the public comments received during the review of the Draft EIS/EIR.

With the completion of the Final EIS/EIR and State decision documents, the operator, with an approved project, would begin drilling additional wells sufficient to operate the 25-MW power plant. It is reasonable to assume that at this point in development the operator would try to obtain two drilling rigs so that two wells could be drilled concurrently, thereby reducing the time to drill all the initial wells for this project. Assuming a binary power plant with well pumps on the production wells to enhance the volume of geothermal resource each well is capable of producing, it is reasonable to assume that six to eight deep wells would be drilled, in additional to the two or three wells already drilled in the initial exploration program. During the drilling of these wells, the access roads, pipelines, and transmission line corridor would be constructed, along with the first binary power plant. Once the wells are completed and tested, the two drilling rigs would be removed from the project area.

With the completion of the new well field, pipelines, roads, transmission lines and the unitized binary power plant, the operator would be in a facility testing phase for at least 30 days following initial operation of the facility. After testing, the facility would be brought on line to begin base load production of electricity.

The operator may wait a year or more before planning for the second 25-MW facility in order to thoroughly test the geothermal reservoir, and equally important, to determine if the mitigation measures associated with the approval of the initial 25-MW facility and well field are achieving their expected results.

For the development of the first 25-MW facility, Table 2-2 identifies the cumulative time necessary to conduct the environmental planning as well as the time for needed for drilling, testing, and construction of the power plant.

Table 2-2 Estimated Time for Planning, Drilling and Construction of One 25-MW Facility

Activity	Time to Complete	Cumulative Time
Initial exploration drilling, two wells, one rig	6 months	6 months
Facility EIS/EIR	12 months	18 months
Development drilling, six wells, two rigs	8 months	26 months
Facility construction	4 months	26 months[a]
Facility testing	1 month	27 months
	Total	**27 months**

[a] Facility construction to be completed within the time required to drill the six additional wells.

The development of the second 25-MW facility would most likely occur in a similar fashion over a similar time frame.

2.2.2 Long Term Development

Assuming the initial phase of development proceeds as expected, the operator would move towards full field development. This section discusses the total development, including the activities presented in Section 2.2.1. For the purposes of the analysis in this EIS, BLM land that would be leased under Alternative 2 would be 7,051 acres currently under lease application, which is 17 percent of the 40,320 acres of all land at the Truckhaven Geothermal Leasing Area. Surface disturbance would be far less than the total acreage of the Truckhaven Geothermal Leasing Area (See Tables 2-3, 2-4, and 2-5). Under Alternative 3, all BLM-administered mineral resources in the Truckhaven Geothermal Leasing Area would be offered for lease (14,731 of the 40,320 acres). This represents a ratio of 36.5 percent. The ratios are used to generally determine how much surface disturbance on BLM land would occur under the two action alternatives. Specific direct impacts would be determined during subsequent authorizations and approval processes. Potential impacts to non-BLM land from surface-disturbing activities are not estimated under Alternative 2. Alternative 3 considers all BLM-managed mineral resources at Truckhaven, including those underlying lands managed by the State for recreation. Because these lands would be leased by the Federal government, potential impacts under Alternative 3 are estimated in this EIS.

The most important data on which to base the RFD scenario come from a production well drilled by Phillips Petroleum in 1981. Although the well file is considered proprietary by the California Division of Oil, Gas, and Geothermal Resources, it is generally known that this well encountered hot water that was producible in paying quantities. Other data from the area included a map of temperature gradients in the area. While the temperature gradient map indicates that geothermal potential is limited to a few specific areas, the RFD scenario is applied to the entire 40,320 acres.

Table 2-3 Surface Disturbance from All Activities

	Alternative 2 – Address Only Pending Noncompetitive Lease Applications	Alternative 3 (Proposed Action) – Lease All BLM-managed Geothermal Resources	Total Disturbance[a]
Acres disturbed	17% of total acres disturbed	36.5% of total acres disturbed	All BLM and non-BLM land
Initial disturbance[b]	85.3 acres	183.3 acres	502.25 acres
Final disturbance[c]	68.9 acres	148 acres	405.25 acres

[a]Disturbance from geothermal development and utilization on BLM and non-BLM managed land.
[b]Initial disturbance would be caused by development of the field, including the construction of production and injection wells, access roads, power plants, and transmission lines.
[c]Final disturbance is that which is left after completion of the field, when some areas around each pad would be subject to reclamation, as well as the disturbance around the pipelines and transmission lines.

Based on the available data, the acreage under consideration, and development seen elsewhere in the region, the RFD scenario assumed that 50 MW (net) of geothermal generation would ultimately be developed within the 40,320-acre Truckhaven area.

2.3 Typical Activities for Geothermal Energy Development

2.3.1 Typical Operations

To provide the reader with a general understanding of geothermal energy development, the following section briefly describes exploration, drilling, development, utilization, and decommissioning activities involved in typical geothermal energy resource activities. Actual development would likely be different given a variety of specific conditions and exploration results.

2.3.2 Production and Injection Wells

To support 50 MW (net) of geothermal generation, the RFD scenario estimates that 50 wells would need to be drilled for production and reinjection. BLM would permit these wells using standard review methods to ensure protection of groundwater, protection of public safety, and prevention of undue or unnecessary degradation to the environment.

The RFD scenario assumes that only one well would be drilled on each well pad, although it is more likely that two or more wells would occupy each pad. That would reduce the overall footprint of development because fewer wells, interconnected pipelines, transmission lines, and access roads would be needed to develop the field to 50-MW (net) production. For the purposes of analysis and to ensure not to underestimate possible impacts, it was assumed that only one well would be drilled on each pad.

Each well is anticipated to be 3,000 to 6,000 feet deep. However, these depths should not be considered a limiting factor when permitting because no strong correlation exists between depth and environmental impacts. In other words, a 12,000-foot well could be drilled with only slightly more impact than a 6,000-foot well, mainly due to the longer drilling time. The difference in impacts is within the high development bias of the RFD scenario.

Using the existing geothermal development at East Mesa (located east of El Centro) as a model and adjusting for a potentially lower-quality resource (i.e., lower temperature), 50 MW (net) of power would eventually require 25 production wells and 25 injection wells. Each well would require a well pad of approximately 2 acres, including minor cut and fill

(Table 2-4). As the topography is relatively flat, land disturbed by cut and fill would be relatively small.

Each well location would need 1 mile of 30-foot-wide access road and 1 mile of pipeline. It is assumed the pipelines would follow the access roads, thereby adding 10 feet to the total width. It is assumed that all drilling locations would remain open for the life of the project.

Table 2-4 Surface Disturbance for Production and Injection Wells

Description	Surface Disturbance per Unit	Number	Total Surface Disturbance
Well locations	2 acres per well	50 wells	100 acres
Access roads	3.6 acres per mile	50 miles	180 acres
Pipelines	1.2 acres per mile	50 miles	60 acres
		Total	**340 acres**

Each well would be expected to take approximately 60 days to drill. During this time, high noise levels would be generated by diesel engines powering the drilling rigs and air compressors/mud pumps as well as from the drawworks, drawworks brake, racking of pipe, and well testing. Up to two drilling rigs could be in operation simultaneously.

Geothermal wells include multiple casing strings at shallow depths to protect groundwater as a BMP. For a 6,000-foot well, surface casing is normally set between 300 and 1,000 feet, an intermediate string is set at 2,000 to 4,000 feet, and a production string is set at 4,000 to 6,000 feet. All casings would be cemented in place using standard industry practice. In addition, all injection wells would be required to be periodically tested for mechanical integrity. The testing protocol would depend on the nature of any aquifers and the type of resource encountered.

2.3.3 Power Plants

It is anticipated that up to two power plants would be built to utilize the resource from the Truckhaven Geothermal Leasing Area. Each power plant would be capable of generating 25 MW (net) of electricity. Given what is currently known about the resource, the power plants would likely utilize binary power generation to produce electricity. It is possible, however, that a flash generation system could be used, possibly in conjunction with the binary plants, to maximize the amount of energy produced. Until more information is gathered during the exploratory phase, the precise technology that would be used is unknown. While the impacts for each of the two types of power generation are similar, there are minor differences, which are discussed in the appropriate sections in Chapter 4.

In a binary cycle, hot water from the wells is gathered and delivered to a heat exchanger located at the power plant site. The heat exchanger transfers heat from the hot water to a secondary fluid, such as iso-butane or iso-pentane. After flowing through the heat exchanger, the cooled geothermal water is sent to injection wells, where it is returned to the reservoir. The hot secondary fluid flashes into a vapor and passes through a turbine. Electricity is created from a generator attached to the turbine shaft. After passing through the turbine, the secondary fluid is condensed into a liquid, and the process is repeated.

As with a dry-steam facility, cold water is circulated through the condenser to further remove heat from the secondary fluid. From the condenser, the circulating water can either be sent to a conventional cooling tower, which uses evaporation, or to an air-cooled unit. Because the binary cycle does not result in a net removal of geothermal water, the cooling tower process relies on outside water sources.

Cooling water would be purchased, likely from either the Imperial Irrigation District or the Coachella Valley Water District system. If one or more fresh water wells are needed, a Condition Use Permit from the County is required under the Land Use Ordinance, Water Well, and Groundwater Ordinance sections. An extension of the Coachella Valley Water District water pipeline system would require Local Agency Formation Commission review and approval (Imperial County 2007).

Each plant location would require about 17 acres, which includes 2 acres of cut and fill (Table 2-5). Each plant would also require 1 mile of access road and 5 miles of new transmission line to intertie with existing transmission lines that run along State Route 86. It is assumed that the access road would require 30 feet of surface disturbance, which includes cut and fill. Transmission intertie lines require 100 feet of initial surface disturbance; however, once the lines are constructed, all but a 20-foot access road would be reclaimed with native vegetation.

Table 2-5 Total Surface Disturbance from Power Plants, Access Roads, and Transmission Lines

Description	Unit Surface Disturbance	Unit	Total Surface Disturbance-Initial/Final
Power plant sites	17 acres per site	2 sites	34 acres
Access roads	3.6 acres per mile	2 miles	7.25 acres
Transmission lines – initial (final)	12.1 acres per mile (2.4 acres per mile)	10 miles	121 acres (24 acres)
		Total – initial (final)	**162.25 acres (65.25 acres)**

2.3.4 Phases of Geothermal Resource Development

The following section briefly describes on-the-ground activities for each phase of geothermal power development. As discussed in Chapter 1, the issuance of geothermal leases confers on the lessee a right to future exploration and development of geothermal resources within the lease area. Ground-disturbing activities are not authorized by the issuance of Federal geothermal leases. If leasing occurs, BLM would conduct additional site-specific environmental analysis to determine whether to issue permits for exploration, development, and utilization of geothermal resources and whether to issue site-specific conditions of approval for each permit. Additional information can be found in Section 2.2, Reasonably Foreseeable Development scenario.

Exploration

For exploration activities, the operator must file an exploration permit that identifies, among many things, the areas to be explored and the method of exploration. When the

operator has filed this permit with the local BLM office, the operator proposal identified in the exploration permit undergoes National Environmental Policy Act (NEPA) review. The BLM may, at its discretion, approve, reject, or modify the permit by requiring additional mitigation measures. Should the operator not be willing to accept the decision, the permit can be modified and resubmitted, or the decision can be appealed. Appendix B contains a more detailed explanation of geothermal exploration and drilling.

Development

The development phase occurs when the operator has located a potentially profitable geothermal reservoir. The operator must file an operations plan, which describes how the operator would drill for and test the geothermal resources covered by the lease. The action proposed in the operations plan would undergo NEPA review by the BLM to evaluate the possible environmental impacts of the action. BLM may again approve, reject, or modify the permit by requiring additional mitigation measures.

Development activities result in the most extensive impacts to the environment due to earthwork activities. Field development is defined as all activities required to develop resources identified during the exploration phase. Defining the resource area's boundaries and capacity also occurs during this time.

Production and operation activities during development include construction, operation, and maintenance of infrastructure to capture/harness the power source; construction of a power plant and installation of transmission lines to distribute generated power; and construction of access roads that are able to handle the large-scale equipment used to construct and maintain the facility.

Utilization

Barring abandonment of exploration and development wells, the final phase of this process is the construction of geothermal power plants or dehydration plants. The BLM office reviews the proposal, called a Utilization Plan, and conducts the appropriate level of NEPA review. The BLM may again approve, reject, or modify the proposal.

Decommissioning/Reclamation

The decommissioning or close-out of a facility occurs when the energy resource has been depleted, or for economic, technological, or environmental concerns. Close-out entails the removal of all hardware and infrastructure improvements that serviced the facility (i.e., roads, concrete pads, and structures) and the rehabilitation of the land in accordance with the reclamation plan approved by the BLM.

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Chapter 3

Affected Environment

3.0 Introduction and Geographic Setting

This chapter provides a description of those portions of the environment that could be affected by the alternatives selected for analysis. Particular emphasis is placed on how those alternatives could affect the unique resource values of the Truckhaven Geothermal Leasing Area. This chapter describes the affected environmental for the general impact assessment found in Chapter 4, Environmental Consequences, which focuses on the potential leasing of geothermal resources at Truckhaven.

Some resource values not found in the proposed action area are not discussed in this chapter unless it would provide context for the analysis in Chapter 4. The following resource disciplines are omitted entirely because they are not found in the Truckhaven Geothermal Leasing Area and are not relevant to the discussion: wild horses and burros, wildfire ecology and management, livestock grazing, wilderness, and caves.

For the purpose of preparing the analysis in Chapter 4 of this EIS, the baseline affected environment is defined as those conditions that exist at the time the BLM decides to approve, reject, or modify the noncompetitive lease applications for the 11 sections in the Truckhaven Geothermal Leasing Area.

3.0.1 Geographic Setting

The proposed action area's name is derived from the early 1980s, when several energy companies became interested in the local geothermal resources. One company, Phillips, called the area Truckhaven on its application for adjacent Federal minerals. It had drilled one well on private land, which was subsequently capped. Phillips called the area "Truckhaven," which was then used by BLM to designate it as a Federal unit and geologic prospect.

Imperial County extends over 4,482 square miles, bordering Mexico on the south, Riverside County on the north, San Diego County on the west, and the State of Arizona on the east. The terrain varies from 235 feet below sea level at the Salton Sea to 4,548 feet above sea level at Blue Angel Peak. Approximately 93 percent (4,175 square miles) of Imperial County is land and 7 percent (307 square miles – predominantly the Salton Sea) is water. The Colorado River forms the County's eastern boundary with the State of Arizona. Two notable geographic features are found in the county: the Salton Sea, at 235 feet below sea level, and the Algodones Dunes, one of the largest dune fields in the United States.

Geographically, the Truckhaven Geothermal Leasing Area is in Western Imperial County within the Colorado Desert, approximately 90 miles east of San Diego near the western shore of the Salton Sea. The Truckhaven Geothermal Leasing Area is southwest of Salton City, a town of approximately 950 people. State-owned lands intermingle with the

Federal land in the proposed action area, much of which is managed as the Ocotillo Wells State Vehicular Recreation Area (OWSVRA). Anza-Borrego Desert State Park (ABDSP), the largest park in the California Department of Parks and Recreation (CDPR) system, lies to the west. Most of the Truckhaven Geothermal Leasing Area is within the eastern portion of the OWSVRA. In addition, some surface and mineral lands within the Truckhaven area are under the jurisdiction of the California State Lands Commission. Some private land is also interspersed with State and Federal land at Truckhaven.

South of Truckhaven lies State Route (SR)-78. Imperial Valley, one of California's and the nation's most productive agricultural regions, is southeast of the proposed leasing area along the southern border of the Salton Sea. The Truckhaven Geothermal Leasing Area has relatively flat terrain, with the Chocolate and Superstition Ranges located to the southeast, and the Peninsular Range separating San Diego and Imperial Counties to the west.

3.1 Air Quality and Climate

3.1.1 Existing Conditions

Specific geographic areas are classified as either "attainment" or "nonattainment" areas for each pollutant, based on the comparison of measured data with Federal and State standards. Responsibility for attaining and maintaining ambient air quality standards in California is divided between the California Air Resources Board (CARB) and regional air pollution control districts. The CARB divides the state into air basins, based on topography and county boundaries. The Truckhaven Geothermal Leasing Area is in Imperial County, California, which is governed by the Imperial County Air Pollution Control District (ICAPCD) within in the Salton Sea Air Basin.

3.1.2 Definition of the Resource

In accordance with Federal Clean Air Act (CAA) requirements, the air quality in a given region or area is measured by the concentration of various pollutants in the atmosphere. The measurements of these "criteria pollutants" in ambient air are expressed in units of parts per million or micrograms per cubic meter ($\mu g/m^3$). The air quality in a region is a result of not only the types and quantities of atmospheric pollutants and pollutant sources in an area, but also surface topography and the prevailing meteorological conditions.

3.1.3 Applicable Regulations, Plans, and Policies

The CAA directs the U.S. Environmental Protection Agency (EPA) to develop, implement, and enforce strong environmental regulations to ensure clean and healthy ambient air quality. To protect public health and welfare, the EPA developed numerical concentration-based standards (National Ambient Air Quality Standards, or NAAQS) for pollutants determined to affect human health and the environment, known as criteria pollutants. NAAQS are currently established for six criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter (PM) including particulates less than 10 microns in diameter (PM_{10}) and particulates equal to or less than 2.5 microns in diameter ($PM_{2.5}$), and lead. The State

of California, through the CARB, has established additional standards that are generally more restrictive than the NAAQS. **Table 3-1 presents** Federal and State standards**.**

Table 3-1 National and California Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS [a]		CAAQS [b]
		Primary Standard [c]	Secondary Standard [d]	Concentration [e]
Ozone (O_3)[f]	1-hour	0.12 ppm (235 μg/m^3)	Same as primary standard	0.09 ppm (180 μg/m^3)
	8-hour	0.08 ppm		0.070 ppm
Carbon monoxide (CO)	8-hour	9.0 ppm (10 μg/m^3)	None	9.0 ppm (10 μg/m^3)
	1-hour	35 ppm (40 μg/m^3)		20 ppm (23 μg/m^3)
Nitrogen dioxide (NO_2)	annual average	0.053 ppm (100 μg/m^3)	Same as primary standard	-
	1-hour	-		0.25 ppm (470 μg/m^3)
Sulfur dioxide (SO_2)	annual average	80 μg/m^3 (0.03 ppm)	-	-
	24-hour	365 μg/m^3 (0.14 ppm)	-	0.04 ppm (105 μg/m^3)
	3-hour	-	1300 μg/m^3 (0.5 ppm)	-
	1-hour	-	-	0.25 ppm (655 μg/m^3)
Suspended particulate matter (PM_{10})	24-hour	150 μg/m^3	Same as primary standard	50 μg/m^3
	annual arithmetic mean	50 μg/m^3		20 μg/m^3 [g]
Fine particulate matter ($PM_{2.5}$)[f]	24-hour	65 μg/m^3	Same as primary standard	-
	annual arithmetic mean	15 μg/m^3		12 μg/m^3 [g]
Lead [h]	30-day average	-	-	1.5 μg/m^3
	calendar quarter	1.5 μg/m^3	Same as primary standard	-
Hydrogen sulfide	1-hour	No Federal standards		0.03 ppm (42 μg/m^3)
Sulfates (SO_4)	24-hour			25 μg/m^3
Visibility reducing particles	8-hour (10 am to 6 pm Pacific Standard Time)			In sufficient amounts to produce an extinction coefficient of 0.23 per kilometer due to particles when the relative humidity is less than 70%
Vinyl chloride [h]	24 Hour			0.01 ppm (26 μg/m^3)

Sources: CARB 2006; EPA 2004.

Key: NAAQS = National Ambient Air Quality Standards; CAAQS = California Ambient Air Quality Standards; ppm=parts per million; μg/m^3=micrograms per cubic meter.

Notes:

[a]NAAQS (other than O_3, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The O_3 standard is attained when the fourth highest 8-hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when 99 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the EPA for further clarification and current Federal policies.

[b]CAAQS for O_3, CO (except Lake Tahoe), SO_2 (1- and 24-hour), NO_2, PM_{10}, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded.

[c]National primary standards are the levels of air quality necessary, with an adequate margin of safety, to protect the public health.

[d]National secondary standards are the levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects

Table 3-1 National and California Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS [a]		CAAQS [b]
		Primary Standard [c]	Secondary Standard [d]	Concentration [e]

of a pollutant.

[e] Concentration expressed first in units in which it was promulgated. In this table, ppm refers to ppm by volume or micromoles of pollutant per mole of gas.

[f] New Federal 8-hour ozone and fine particulate matter standards were promulgated by the EPA on July 19, 1997. The federal 1-hour O_3 standard continues to apply in areas that violated the standard. On April 15, 2004, the EPA issued attainment designations for the 8-hour standard and described plans for the phase-out of the 1-hour standard (EPA 2004).

[g] On June 5, 2003, the California Office of Administrative Law approved the amendments to the regulations for the State ambient air quality standards for particulate matter and sulfates. Those amendments established a new annual average standard for $PM_{2.5}$ of 12 $\mu g/m^3$ and reduced the level of the annual average standard for PM_{10} to 20 $\mu g/m^3$. The approved amendments were filed with the Secretary of State on June 5, 2003. The regulations became effective on July 5, 2003.

[h] The CARB has identified lead and vinyl chloride as "toxic air contaminants with no threshold level of exposure for adverse health effects determined." These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

Federal standards for 8-hour O_3 and $PM_{2.5}$ became effective on July 18, 1997, and were subsequently challenged and litigated. The U.S. Supreme Court affirmed the standards, and policies and systems to implement these new standards are being developed. On April 15, 2004, the EPA issued a final ruling for the 8-hour O_3 designations and controls (EPA 2004). The EPA designated Imperial County as a serious nonattainment area for PM_{10}, unclassified for $PM_{2.5}$, and marginal nonattainment for O_3 (CARB 1998). An attainment area is defined as a geographical area identified to have air quality as good as or better than the NAAQS/CAAQS. An area may be an attainment area for one pollutant and a nonattainment area for others.

Section 176 of the 1990 CAA Amendments requires the EPA to promulgate rules to ensure Federal actions conform to the appropriate State Implementation Plan (SIP). These rules, known together as the General Conformity Rule (40 CFR 51.850-.860 and 40 CFR 93.150-.160), require any Federal agency responsible for an action in a nonattainment area to determine that the action conforms to the applicable SIP or is exempt from the General Conformity Rule requirements. This means federally supported or funded activities will not: (1) cause or contribute to any new air quality standard violation; (2) increase the frequency or severity of any existing standard violation; or (3) delay the timely attainment of any standard, interim emission reduction, or other milestone.

Actions would conform to a SIP and be exempt from a conformity determination if an applicability analysis shows the total direct and indirect emissions from the project construction and operation activities would be less than specified emission rate thresholds, known as *de minimis* limits, and that emissions would be less than 10 percent of the area's emission budget.

3.1.4 Existing Air Quality

The Truckhaven area is in Imperial County and the Salton Sea Air Basin. The Salton Sea Air Basin encompasses all of Imperial County and a portion of central Riverside County.

The Truckhaven area is located wholly within Imperial County; therefore, the regulations and standards applicable in Imperial County are appropriate for this assessment.

Ambient air quality for the Salton Sea Air Basin is measured at several monitoring locations within Imperial County. The monitoring sites include:

- Brawley-Main Street (PM)
- Brawley-220 Main Street (PM)
- Calexico-East (PM and ozone)
- Calexico-Ethel Street (PM and ozone)
- Calexico-Grant Street (ozone)
- El Centro-9th Street (PM and ozone)
- Niland-English Road (ozone)
- Westmorland-West 1st Street (ozone)

Although some decreasing trends have been noted at these sites, data indicate air quality issues are still a concern in Imperial County. Particulate levels frequently exceed the state 24-hour PM_{10} standard of 50 μg/m³. These monitoring locations also consistently exceed the state annual standard of 20 μg/m³ and exceed both of the national PM_{10} standards: the 24-hour standard of 150 μg/m³ and the annual standard of 50 μg/m^3. The highest 24-hour average PM_{10} concentrations occurred at the Calexico monitoring sites, near the large city of Mexicali in Mexico (SDG&E 2006).

Wind-generated dust can produce very high episodic PM_{10} concentrations. Frequent high concentrations on windy days can also result in high annual average concentrations. In 2004, $PM_{2.5}$ levels exceeded the Federal 24-hour $PM_{2.5}$ standard. It has been estimated that approximately 72 percent of the $PM_{2.5}$ in Calexico is from combustion sources (SDG&E 2006).

Except for the Calexico-Ethel Street and Westmorland sites, days exceeding the ozone standards have had a declining trend since 1992 (SDG&E 2006).

In Imperial County, the ICAPCD is the agency responsible for protecting the public health and welfare through the administration of Federal and State air quality laws and policies. Included in the ICAPCD's tasks are monitoring air pollution, preparing the Imperial County portion of the SIP, and promulgating District rules and regulations. The SIP includes strategies and tactics used to attain and maintain acceptable air quality in the County; these strategies are called the Regional Air Quality Strategies. The rules and regulations include procedures and requirements to control pollutant emissions and prevent significant adverse impacts.

3.1.5 Compliance with Air Quality Standards/Regional and Local Air Quality

If an area is redesignated from nonattainment to attainment, the CAA requires a revision to the SIP, called a maintenance plan, to demonstrate how the air quality standard will be maintained for at least 10 years.

Table 3-2 shows Imperial County's attainment status with regard to the CAAQS and NAAQS. As shown, Imperial County is in attainment with regard to CO, NO_2, SO_2, sulfates, and lead; and is currently classified as nonattainment with regard to 0_3 and PM.

Table 3-2 Imperial County Attainment Status

Standard	CAAQS Attainment Status	NAAQS Attainment Status
0_3 – 1-hour	"Moderate" Nonattainment	N/A
0_3 – 8-hour	N/A	Marginal Nonattainment
$PM_{2.5}$ – 24-hour	Unclassified	Unclassified
$PM_{2.5}$ – annual	Unclassified	Unclassified
PM_{10} – 24-hour	Nonattainment	Serious Nonattainment
PM_{10} – annual	Nonattainment	Serious Nonattainment
CO	Unclassified	Unclassified
NO_2	Attainment	Unclassified
SO_2	Attainment	Attainment
Sulfates	Attainment	N/A
Lead	Attainment	N/A
H_2S	Unclassified	N/A
Visibility reducing particles	Unclassified	N/A

Key: NA = not applicable.

The State and Local Air Monitoring Network Plan provides a wealth of information about ambient air quality air monitoring sites in California and the northern Baja California portion of Mexico. The CARB operates air monitoring stations throughout the State. Most of the local districts operate air monitoring stations within their jurisdictions. In some portions of the State, private contractors operate monitoring stations by permit. The National Park Service also operates a number of air monitoring stations in the National Parks and National Monuments throughout California. There are a few monitoring stations located in Tijuana, Mexicali, and Rosarito Playas (Mexico), operated by a contractor for the CARB.

The Salton Sea Air Basin regularly exceeds of the CAAQS 1-hour 0_3 standard (54 days with exceedences in 2005) and the NAAQS 8-hour 0_3 standard (43 days with exceedences in 2005).

With respect to particulate matter, the Salton Sea Air Basin experiences regularly exceeds the CAAQS PM_{10} 24-hour standard (160 days with exceedences in 2005). The Salton Sea Air Basin also experiences exceedences of the NAAQS PM_{10} 24-hour standard (8.5 days with exceedences in 2005). $PM_{2.5}$ data for the Salton Sea Air Basin is not yet available, but monitoring stations are being adapted to gather data for the $PM_{2.5}$ standard.

3.1.6 Climate

Imperial County climatic conditions are characterized by large warming of air masses. The coastal mountains prevent the intrusion of any cool, damp marine air, and the Imperial Valley experiences clear skies, very low humidity, extremely hot summers, mild winters, and little rainfall. The prevailing wind directions at Niland, approximately 25 miles southeast of the Truckhaven area, are from the southeast (38 percent frequency) and the west (14 percent frequency). The average wind speed is approximately 7.5 miles per hour (U.S. Bureau of Reclamation 2002).

Temperature and precipitation measured in nearby Brawley is shown in Table 3-3.

Table 3-3 Temperature and Precipitation in Brawley, California

Month	Average Max Temp (ºF)	Average Min Temp (ºF)	Average Precipitation (Inches)
January	69.5	39.3	0.38
February	73.6	43.3	0.39
March	79.2	47.8	0.26
April	86.3	53.3	0.08
May	94.3	60.0	0.03
June	103.1	66.8	0.01
July	107.7	75.2	0.05
August	106.6	76.0	0.33
September	102.5	69.7	0.29
October	91.7	58.5	0.24
November	78.8	46.1	0.16
December	70.1	39.6	0.44
Annual	**88.6**	**56.3**	**2.66**

Source: WRCC 2007a.

3.2 Noise

3.2.1 Existing Conditions

The proposed action is located in the undeveloped desert of western Imperial County, California.

3.2.2 Definition of the Resource

Noise is generally defined as unwanted or annoying sound that is typically associated with human activity and that interferes with or disrupts normal activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise, the perceived

importance of the noise and its appropriateness in the setting, the time of day and the type of activity during which the noise occurs, and the sensitivity of the individual. Therefore, the "A-weighted" noise scale, which weights the frequencies to which humans are sensitive, is used for measurements. Noise levels using A-weighted measurements are sometimes written as "dBA."

In the United States, several noise metrics have been developed to describe noise levels depending on the character of the noise. Average noise levels over a period of minutes or hours are usually expressed as dB L_{eq}, the equivalent noise level. The period of time average may be specified; $L_{eq(3)}$ would be a 3-hour average. For continuous noise sources, such as roadways, noise levels are often averaged over a period of 24 hours and are normally weighted to account for greater human sensitivity to noise in the evening and nighttime hours. These 24-hour noise metrics are the community noise equivalent level and the day-night level.

3.2.3 Applicable Plans, Policies, and Regulations

The Noise Element of the Imperial County General Plan provides a program for incorporating noise issues into the land use and planning process, with a goal of minimizing adverse noise impacts to sensitive noise receptors. The Noise Element establishes goals, objectives, and procedures to protect the public from noise intrusion. The Noise Element for Imperial County is applicable to lands owned or zoned by the county. However, lands regulated by the State or Federal government, such as the OWSVRA, are preempted from local land use policy (Imperial County 2003). Approximately one-third of the Truckhaven area is privately owned land and is subject to the goals and objectives of the Noise Element of the Imperial County General Plan, which include:

- Goal 1: Provide an acceptable noise environment for existing and future residents in Imperial County.
- Objective 1.1: Adopt noise standards which protect sensitive noise receptors from adverse impact.
- Objective 1.2: Ensure that noise standards and policies are compatible with the standards and policies of other General Plan Elements and other County agencies.
- Objective 1.3: Control noise levels at the source where feasible.
- Objective 1.4: Coordinate with airport operators to ensure operations are in conformance with approved Airport Land Use Plans.
- Objective 1.5: Identify sensitive receptors with noise environments which are less than acceptable, and evaluate measures to improve the noise environment.

- Objective 1.6: Collect data for existing noise sources in the County to improve the data base and enhance the ability to evaluate proposed projects and land uses.

Proposed Action Area

The Truckhaven Geothermal Leasing Area is located in an area with primarily recreational land uses. The nearest noise-sensitive receptors to the proposed action area are single-family residences located in Salton City approximately 1 mile north of the northernmost BLM parcels.

3.2.4 Existing Noise Levels

The Truckhaven Geothermal Leasing Area is in a relatively remote desert region of the County. ABDSP lies 3 miles to the west of the Truckhaven area. A majority of the proposed action area, 83 percent, lies within the OWSVRA. Recreational activities occurring on OWSVRA include off-highway vehicle (OHV) use and camping.

In deserts where the natural sound pressure levels are very low, vehicular use on a route associated with recreational activities affect hearing in some vertebrates. Natural deserts do not exceed 66 dBA, and no desert animal creates sounds above 56 dBA. Mechanized sounds increase the decibels in the desert. A motorcycle ranges from 40 to 100 dBA. Within 300 feet, the peak noise levels created by a motorcycle exceed those of naturally occurring sounds (USDI BLM 2003a)

Ambient noise level measurements for OWSVRA and the Truckhaven Geothermal Leasing Area are not available. However, ambient noise levels in the proposed action area and vicinity generally are assumed to be low and typical of remote desert areas (i.e., 35 to 50 dBA), except as may be modified by noise-generating activities in the vicinity, including:

- Noise associated with occasional recreational and support activities, especially OHV uses of the Truckhaven Geothermal Leasing Area and immediate vicinity;

- Ambient vehicular traffic noise on SR-78 and SR-86 leading to the OWSVRA and to the Imperial County landfill, which is located within the Truckhaven area;

- Aircraft overflights associated with the Borrego Springs Airport, located west of the Truckhaven area;

- Occasional military aircraft overflights associated with flight corridors located southeast of the Truckhaven area;

- U.S. Border Patrol helicopter use of the proposed action area as a part of providing medical aid, and as a part of apprehending undocumented immigrants and smugglers; and

- Natural sources such as wind, rain, thunder, and wildlife.

3.2.5 Off-highway Vehicle Noise Levels

OHV activities and vehicular traffic within the OWSVRA are the primary noise sources in the Truckhaven Geothermal Leasing Area. OHV noise levels are variable, with older vehicles producing higher noise levels than newer ones. California Vehicle Code Section 38370 requires that dBA levels (measured at 50 feet) for Green Sticker vehicles (vehicles registered as OHV in California) be below (1) 92 dbA for any such vehicle manufactured before January 1, 1973; (2) 88 dbA for any such vehicle manufactured on or after January 1, 1973, and before January 1, 1975; (3) 86 dbA for any such vehicle manufactured on or after January 1, 1975, and before January 1, 1986; and (4) 82 dbA for any such vehicle manufactured on or after January 1, 1986. Tests conducted at the Oregon Dunes National Recreation Area concluded that, even with mufflers, noise levels from all-terrain vehicles are found to be in the range of 81 to 111 dBA per unit at a distance of 20 inches (Scharf 1999). A noise level of 111 dBA at 20 inches is estimated to attenuate to a level of approximately 85 dBA at a distance of 50 feet. For purposes of this section, 92 dBA will be the average assumed noise level at 50 feet for OHV use within the OWSVRA.

The level of recreation al activities in or near the Truckhaven Geothermal Leasing Area (associated with the OWSVRA) varies throughout the year with little, if any, OHV use and noise during the summer months. Virtually all OHV usage in OWSVRA occurs from approximately mid-October to Easter, with an estimated 50 percent of OHV usage occurring on the following six holiday weekends: Halloween, Thanksgiving, New Year's, Martin Luther King Jr., President's Day, and Easter. During these high-use weekends, OHV-related noise levels can be relatively high within certain areas of the OWSVRA. The remaining 50 percent of annual OHV usage occurs primarily on other weekends throughout the October to May period. Therefore, background OHV noise levels in and around the Truckhaven Geothermal Leasing Area range from low during weekdays to moderate during moderate-use weekends and high during the six high-use weekends. According to the State, based on an annual visitation of 1.9 million people and an average of three occupants per vehicle, there would be approximately 633,000 vehicle trips to the recreation area (CDPR 2007) with the vast majority occurring between October and May.

3.2.6 Sensitive Receptors

Sensitive noise receptors are, in general, those areas of human habitation or substantial use where the intrusion of noise has the potential to adversely impact the occupancy, use, or enjoyment of the environment. These can include residences, schools, hospitals, parks, and places of business requiring low levels of noise. Since the BLM parcels under consideration for geothermal development are situated in a very remote area, there are no likely sensitive human receptors in or anywhere near the Truckhaven Geothermal Leasing Area. Hiking and flora/fauna observation activities that occur in the ABDSP would not be affected by construction or operation activities due to the several miles of distance separating the two locations.

The closest area of likely sensitive receptors would be within the town of Salton City, located approximately 1 mile north of the northernmost of the BLM geothermal parcels to the northeast of the Truckhaven Geothermal Leasing Area.

3.3 Topography, Geology, and Geologic Hazards

3.3.1 Topography

The Truckhaven area is over 40,320 acres. The area's topography consists mainly of gentle hills and washes. The slopes trend downward to the east, toward the Salton Sea. The elevation ranges from several hundred feet on some hilltops to approximately 235 feet below sea level at the surface of the Salton Sea. Of the 23 sections of BLM land in the Truckhaven area, approximately six sections of land, in the northeast portion of the area, are below sea level. The San Felipe Hills are located in the southern half of the proposed action area.

3.3.2 Geologic Setting

The Truckhaven area's landforms result from the underlying geology. The region is part of the Colorado Desert geomorphic province. Major features of the area include the Salton Trough, which includes the Salton Sea and the Imperial Valley. The Salton Trough was created by the pull-apart basin bordered by the San Andreas Transform System to the northeast and the San Jacinto Fault Zone to the southwest. The basin is an extension of the Gulf of California and is separated from the Gulf by the Colorado River Delta. Marine and freshwater sediment, several miles thick, have partially filled the trough. Surface sediments consist of Holocene clay and silt alluvium grading to sandy gravel near the mountains (CEPA 2006).

The current Salton Sea was formed in 1905 when flooding from the Colorado River broke through irrigation canals and created the lake. However, it overlies the same location of the Pleistocene age Lake Cahuilla. Many of the old shorelines are visible on the hill surrounding the Salton Sea. One prominent shoreline is found at an elevation of 44 feet above sea level. Carbon-14 dating has shown that Lake Cahuilla existed up until just a few hundred years ago (Busch 1995).

Figure 3-1 presents a soils map of the proposed action area. The surface deposits consist mainly of (from youngest to oldest) Holocene or recent surficial deposits including alluvium, Lake Cahuilla deposits, and sand dunes; Pleistocene Brawley Formation, a fine-grained sandstone and mudstone from the Colorado River; the Pliocene Borrego Formation, consisting of mudstone and clay stone dominantly from the Colorado River; a Pliocene transitional unit of mudstone and sandstone; and the Pliocene Diablo Formation. The Diablo Formation includes crossbedded Colorado River-derived sandstone and red massive mudstone (Kirby 2005).

3.3.3 Seismicity

The Salton Trough is in a geologically active area. The San Andreas Fault Zone is found on the east side of the Salton Sea, the Imperial Fault is found south of the sea, and the San Jacinto and Elsinore Faults are found on the west side of the sea. Most of these

faults exhibit right lateral strike-slip motion. The Brawley seismic spreading zone is southeast of the sea and is an active geothermal area.

Active surface fault rupture has not been mapped in the project area as part of the Alquist-Priolo Earthquake Fault Zoning Act. The Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. However, fault ruptures from 1968, 1979, and 1987 have been mapped within a few miles of the Truckhaven area (CDC 1974a, 1974b, 1990). In 1987, 90 centimeters (35 inches) of displacement was associated with the Richter Magnitude 6.6 earthquake on the Superstition Hills Fault. Significant nearby earthquakes are listed in Table 3-4.

Table 3-4 Significant Nearby Earthquakes in the Past 100 Years

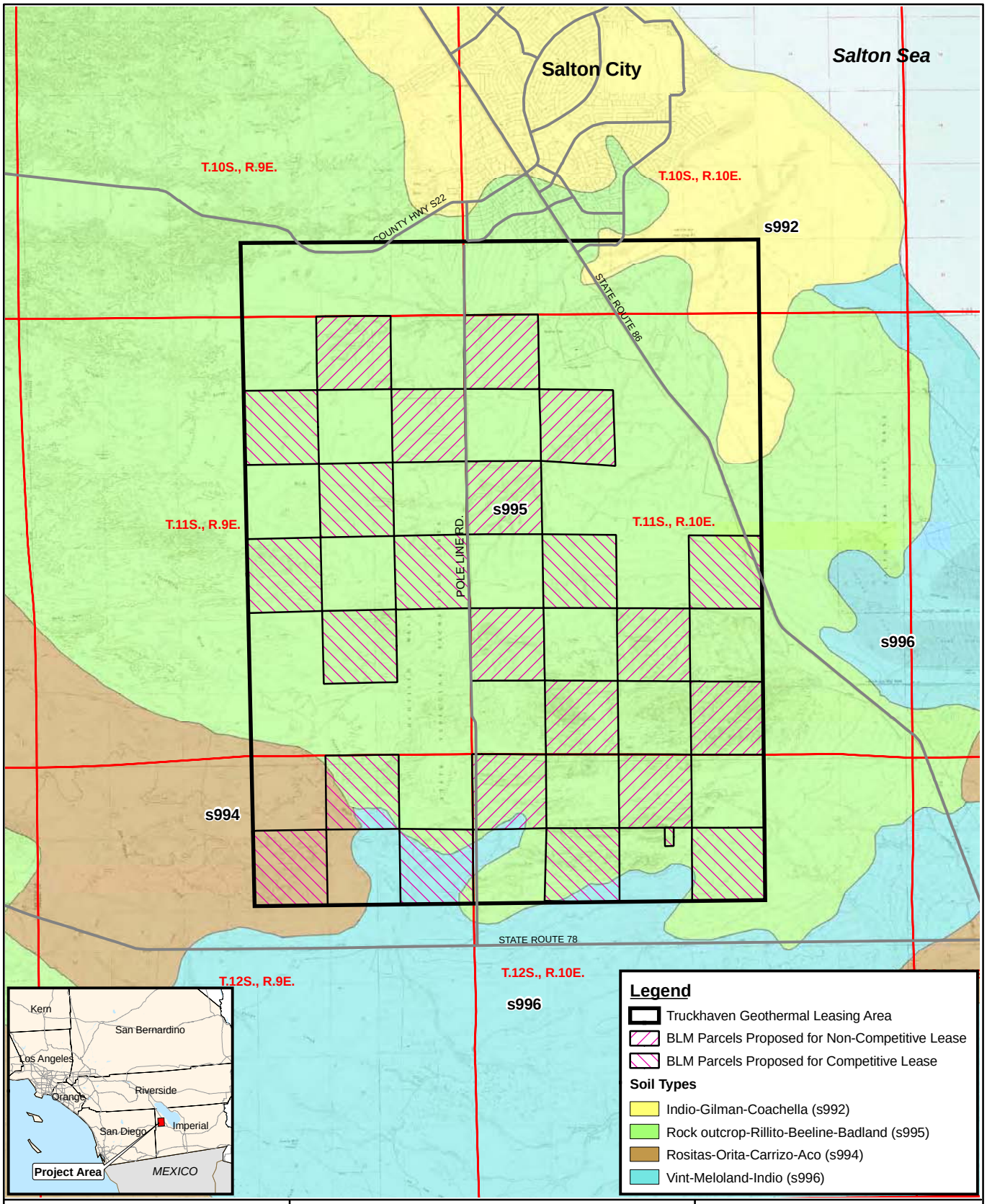
Date	Earthquake	Approximate Magnitude	Faults
March 25, 1937	San Jacinto (Terwilliger Valley)	6.0	San Jacinto Fault
May 18, 1940	Imperial Valley	6.9	Imperial Fault
April 8, 1968	Borrego Mountain	6.5	Coyote Creek Fault (branch of the San Jacinto Fault Zone)
October 15, 1979	Imperial Valley	6.4	Imperial, Brawley, and Rico Faults
November 23, 1987	Elmore Ranch/ Superstition Hills	6.2	Elmore Ranch and Lone Tree Faults
November 24, 1987	Elmore Ranch/ Superstition Hills	6.6	Superstition Hills Fault

Source: SCEC 2006.

Other faults cutting Pliocene age strata have been mapped on BLM-administered land within the Truckhaven area. These faults include the Dump, En Echelon, Powerline, and Sand Dunes Faults (Kirby 2005).

3.4 Soils

Nearly all of the BLM-administered lands within the Truckhaven Geothermal Leasing Area belong to the Rillito-Beeline-Badland soil association with some possible rock outcrops in the hills. The Rillito and Beeline soils are well-drained soils that form on mixed alluvium, fan terraces, and hill slopes. The furthest southwestern parts of the Truckhaven area consist of Vint-Meloland-Indio soils, which form on nearly level land and are well-drained fine sand to silt loam. They tend to have high permeability and very low runoff characteristics. These soils are prone to wind and water erosion and are subject to flash flooding and ponding. With irrigation, Vint soil could support agriculture (Zimmerman 1981).



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ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

TRUCKHAVEN GEOTHERMAL LEASING AREA

FINAL EIS

Figure 3-1
Soils Map

Job Id:

Date: 12/28/2006

GIS Analyst: avh

Map Source Information: USGS Topographic Quadrangle 1:24,000. Terraserver.

3.4.1 Erosion

Soil erosion affects stormwater quality and can damage surface structures such as roads. Therefore, soil erodibility should be considered when planning and designing access and maintenance roads. Soil erodibility is rated as slight, moderate, and severe. The rating is slight when the surface layer texture is clay that holds together, is thicker than 40 inches, and occurs on slopes of less than 15 percent. A moderate rating is given when the surface layer texture is clay loam, loam, or sandy loam that holds together moderately well, is between 20 and 40 inches thick, and occurs on slopes of between 15 percent and 30 percent. A severe rating is given to soils when the surface layer texture is sand or loamy sand that is weakly held together, is less than 20 inches thick, and lies on slopes of greater than 30 percent. Soils in the proposed action area that exhibit potentially severe and severe-to-very-severe water or wind erodibility occur throughout the Truckhaven area, particularly in the southwest (SDG&E 2006).

3.5 Water Resources

3.5.1 Surface Water Resources

Most of the Truckhaven area is in the West Salton Hydrologic Unit. The southern approximate one-third of the area is in the Ocotillo Lower Felipe Hydrologic Sub-Area. Annual average precipitation is about 2.5 inches (CEPA 2006). Surface drainage is northeastward to the Salton Sea. The southeast corner of the project area drains south and east to Tarantula Wash and San Felipe Creek, then to the Salton Sea. Among the major intermittent drainages within the project area are Arroyo Salada, located in the northern quarter of the lease area; and Tule Wash, which drains much of the central and northern portion of the area (CEPA 2005). The Water Quality Control Plan for the Colorado River Basin lists the beneficial uses of surface water from San Felipe Creek and Tule Creek as agriculture supply, groundwater recharge, recreation, warm freshwater habitat, and wildlife habitat (CEPA 2005). These two creeks have some water in them much of the year. The major drainages are subject to flash floods during heavy rainfall (FEMA 2006).

3.5.2 Groundwater Resources

Most of the parcels available for lease are within the West Salton Sea Sub-basin of the Colorado River Hydrologic Region. The beneficial use of groundwater in the West Salton Sea Hydrologic Unit are listed in the Water Quality Control Plan as municipal and agricultural (CEPA 2005), with municipal usage limited to only a small portion of the hydrologic unit. Groundwater is found in unconsolidated younger Quaternary alluvial deposits and the underlying unconsolidated to semi-consolidated older Tertiary to Quaternary alluvial deposits. Fine-grained lacustral deposits of the former Lake Cahuilla may form confining layers that impede the downward and lateral movement of groundwater in the project area (CDWR 2003; CEPA 2005). There are few wells and little information available on the groundwater quality, use, capacity, or budget in this area. However, groundwater levels have reportedly dropped 64 feet in a well located in the northeast part of the basin between 1979 and 2000 (CDWR 2003).

Groundwater quality in this sub-basin is reportedly of marginal to poor quality for domestic and irrigation purposes because of elevated concentrations of fluoride, boron, and total dissolved solids (TDS). The aquifer, however, is an important natural resource for plants and animal communities (CDPR 2007). TDS concentration reportedly averages about 5,800 milligrams per liter (mg/L) (CDWR 2003). Because of the high TDS and mineral content, the groundwater has limited use in this sub-basin. Groundwater is found in monitoring wells at the Salton City municipal landfill at a depth of 20 to 32 feet below ground (CEPA 2006). This landfill is located the northern half of Section 12, T.11 S., R. 9 E. San Bernardino Meridian (SBM) (one of the sections up for lease in Alternatives 2 and 3). TDS in groundwater around the landfill ranges from 3,000 to 21,000 mg/L.

Geothermal fluids below 7,000 feet from the Salton Sea area can vary in TDS from 7,000 to over 200,000 mg/L and can contain some suspended solids. The suspended and dissolved solids that precipitate out of solution for a flash-type geothermal plant could present a disposal challenge as they could be hazardous waste, but combined solids typically contain designated waste materials not acceptable by municipal landfills. Therefore, most geothermal electrical power plants have waste discharge requirements on surface impoundments and drilling sumps to temporary store geothermal wastes. The waste discharge requirements are obtained from the Colorado River Basin Regional Water Quality Control Board. The TDS in geothermal fluids below Truckhaven can be expected to be no more than 5,000 parts per million.

3.5.3 Floodplains

The area's major drainages, such as Tule Wash and San Felipe Creek, are subject to flash floods during heavy rain storms and are located within 100-year flood zones (FEMA 2006).

3.6 Vegetation

Although a common attribute of deserts is the sparseness of vegetation, plants are an essential part of the desert ecosystem, providing essential habitat for wildlife such as burrows and protective cover from high temperatures and predators (USDI BLM 1999). Vegetation within the Truckhaven Geothermal Leasing Area has adapted to the arid climate of the Borrego Valley-West Mesa subsection of the Colorado Desert ecoregion (USFS 1998). This subsection lies on the southwest side of Imperial Valley, with elevations ranging from 230 feet below sea level at the Salton Sea to 2,200 feet above sea level at the Peninsular Ranges. Desert vegetation is supported by average annual precipitation of approximately 3 to 4 inches. Average high temperatures recorded at El Centro range from 70 degrees Fahrenheit (°F) in January to 107°F in July. Average low temperatures range from 40°F in January to 75°F in July (WRCC 2007b).

Dominant vegetation is comprised of drought-tolerant plants, such as small, hard-leaved, or spiny shrubs, cacti, and hard grasses (CDFG 2006a). These plants survive in the desert because they have adapted methods of water conservation and storage. The two major vegetation communities within the project area include the creosote bush scrub and

saltbush scrub (USFS 1998). Eastern parts of the proposed action area and areas bordering the Salton Sea also include the allscale vegetation community. Individual plants in all these vegetation communities are widely spaced and provide little ground cover. Some portions of the desert may have no visible plants and are made of shifting sand dunes or nearly sterile salt flats. Depending on the duration and intensity of rainfall, perennial and annual species will vary.

3.6.1 Creosote Bush Scrub

The creosote bush scrub (Figure 3-2) is the most common plant community in the Truckhaven Geothermal Leasing Area (USFS 1998). This plant community typically occurs on well-drained secondary soils of slopes, fans, and valleys. This habitat type is generally characterized by relatively barren ground with wide-spaced shrubs. Common plants include pure stands of creosote bush *(Larrea tridentate)* or mixed shrubs, including species of burrobush/white bursage *(Ambrosia dumosa)*, brittlebush *(Encelia farinosa)*, ocotillo *(Fouquieria splendens)*, and saltbushes *(Atriplex)* (Sawyer 1995). Less abundant species may include desert-holly *(Atriplex hymenelytra)*, ephedras *(Ephedra* species*)*, box-thorns *(Lycium* species*)*, prickly-pears *(Opuntia* species*)*, and indigo bush *(Psorothamnus schottii)*.

Figure 3-2 Typical Distribution of Creosote Bush in the Truckhaven Area

A vegetation community closely associated with the creosote bush scrub is the ocotillo. This vegetation community occupies similar soils but is distinguished by conspicuous populations of ocotillo (USFS 1998). Common species include ocotillo *(Fouquieria splendens)* and creosote bush *(Larrea tridentate)* (Sawyer 1995). Less abundant species include those species associated with the creosote bush scrub as well as desert agave

(Agave deserti), blue palo verde *(Cerdidium floridum)*, barrel cactus *(Ferocactus cylindraceus)*, ironwood *(Olneya tesota)*, and smoke tree *(Psorothamnus spinosa)*.

3.6.2 Saltbush Scrub

The saltbush scrub is common on basin floors, occupying bajadas, flats, lower slopes, playas, and valleys (USFS 1998). This series is a temperate, broad-leaved, evergreen shrubland with common species that include fourwing saltbush *(Atriplex canescens)*, shadscale *(Atriplex confertifolia)*, big saltbush *(Atriplex lentiformis)*, and allscale *(Atriplex polycarpa)* (Sawyer 1995).

3.6.3 Allscale

Often considered part of the saltbush scrub, the allscale plant community is found bordering the Salton Sea and may be found within the proposed action area. This series is found in old beach soils, lake deposits, dissected alluvial fans, and rolling hills. Dominant species include allscale *(Atriplex polycarpa)* and saltbushes *(Atriplex* species*)* (Sawyer 1995). Other common species include saltgrass *(Distichlis spicata)*, California ephedra *(Ephedra californica)*, buckwheats *(Eriogonum* species*)*, algodones buckwheat *(Eriogonum deserticola)*, California buckwheat *(Eriogonum fasciculatum)*, cheesebush *(Hymenoclea salsola)*, paleleaf goldenbush *(Isocoma acradenia)*, bladderpod *(Isomeris arborea)*, and honey mesquite *(Prosopis glandulosa)*.

In years of good rainfall, annual species may include desert sand verbena *(Abronia villosa)*, cryptantha *(Cryptantha* species*)*, and birdcage evening primrose *(Oenothera deltoids* var. *deltoids)* (Dreyfuss 2006).

Several special status species are known to occur or may potentially occur within the vicinity of the proposed action. Special status species include federally listed endangered, threatened, proposed, and candidate plant species; California State-listed endangered, threatened, and rare plant species; and BLM sensitive plant species. See Section 3.8, Special Status Species, for discussion of these species.

3.6.4 Invasive Species

Invasive species are considered by BLM to be plants that have been introduced into an environment where they did not evolve (USDI BLM 2006). As a result, these plants usually have no natural predators to limit their reproduction and distribution, quickly spreading out of control. Invasive species can have dramatic impacts on the natural ecosystem by reducing habitat for native vegetation and can alter forage and wildlife habitat. Invasive species reduce the productivity of healthy rangelands, forest lands, riparian areas, and wetlands. Eradication of these species is intensive, time consuming, and costly.

In California, it is estimated that 3 percent of plant species growing in the wild are considered invasive species. Despite this small percentage, these species occupy a much greater proportion of area (CIPC 2006). Known invasive species within the project area include Sahara mustard *(Brassica tournefortii)* and saltcedar *(Tamarix* species*)* (Dreyfuss 2006). Sahara mustard is highly invasive in the Colorado Desert, adapting to dry sandy

soils and out-competing native species, particularly desert annuals (CIPC 2006). Saltcedar thrives in riparian areas and wetlands but is also tolerant of arid ecosystems. Saltcedar out-competes native vegetation by consuming large quantities of groundwater and depositing salts, making the soil too dry and saline for native vegetation. The BLM El Centro Field Office has an active management plan to address saltcedar.

3.6.5 Wetlands/Riparian Areas

Wetland and riparian areas are a rare occurrence within the California Desert Conservation Area (CDCA) (USDI BLM 1999). There are no wetlands or riparian areas located within or immediately adjacent to the project area (USFWS 2006). Traversing the project area are four ephemeral streams that drain into the Salton Sea: the Arroyo Salada, Surprise Wash, Tule Wash, and Tarantula Wash. However, because this region receives only 3 to 4 inches of annual precipitation, these washes are most often dry and do not support distinct riparian vegetation.

3.7 Fish and Wildlife

3.7.1 Fisheries

Because of limited hydrological connection among water bodies within the desert, fish distribution is also limited. Some streams continually flow through desert regions, terminating in closed lakes or dissipating in the sand, while other streams originate from subterranean sources, emerging as springs. Springs occur throughout the desert ecosystem, ranging from quiet pools or trickles to active aquifers. Many larger springs emit warm water, with temperatures above the mean annual air temperature, and range from fresh to highly mineralized, carrying large amounts of dissolved materials or extremely low dissolved oxygen levels (Naiman 1981). Although each spring or pool is species-poor, most aquatic inhabitants of each pool are short-lived (1 to 2 years) and native to only a single locality (Naiman 1981; Page and Burr 1991). Surface water resources are negligible in the sandy, mountainous, and arid environment of the proposed action area; there are no fish-bearing waters (including springs, seeps, or slow-moving streams) within the Truckhaven Geothermal Leasing Area. However, there are waters in the greater surrounding area that contain fish suited for this harsh environment.

One fish that has adapted to this environment is the desert pupfish (*Cyprinodon macularius*), federally listed as endangered (see Section 3.8, Special Status Species, for more discussion on the absence of this species in the Truckhaven Geothermal Leasing Area). The desert pupfish range includes the basin of the lower Colorado and Gila Rivers, from southern Arizona to southeastern California and eastern Baja California, and the Sonoyta River of northern Sonora, Mexico (Sutton 1999). Pupfish are observed throughout the Salton Sink Basin, inhabiting springs, seeps, and slow-moving streams. Desert pupfish populations are remnants of those that inhabited ancient Lake Cahuilla.

3.7.2 Wildlife

Animal abundance and diversity are closely linked with the habitat types present, though abundance and distribution may vary by seasons. In the Salton Basin, vertebrate and invertebrate life forms, predominantly desert creosote bush habitat atop an extensive

alkali sink, have established populations in this unique and seemingly inhospitable landscape. The poor habitat conditions, limited foraging, high average temperatures, sparse precipitation, and limited vegetation cover limit the number of species and size of wildlife populations.

Desert animals are adapted to survive under extreme environmental conditions, including low, erratic rainfall and highly variable temperatures. Many small desert mammals require no freestanding water but survive on their own metabolic water and through water conservation measures. For example, reptiles and small mammals are active mostly at night and retreat to cool burrows or seek shelter under vegetation or in rock outcrops to avoid the midday sun and to reduce water loss.

A variety of reptiles and amphibians utilize the project area, including the San Sebastian leopard frog (or lowland leopard frog, *Rana yavapaiensis*), Couch's spadefoot toad (*Scaphiopus couchi*), and the flat-tailed horned lizard (*Phrynosoma mcallii*). These species are well-adapted to extremely dry conditions in areas with sandy, well-drained soils often occupied by creosote bush and mesquite trees, as is suitable for the Couch's spadefoot toad. Slackwater aquatic habitats, canals, roadside ditches, ponds, and riparian grasses of the Salton Basin also provide habitat, such as that of the San Sebastian leopard frog (CDFG 1994).

Talus slopes, cliffs, and rock outcrops provide nesting and feeding habitat, thermal and escape cover, and resting sites for a variety of wildlife. In addition, the extensive root systems of desert plants such as creosote bush provide access to subsurface openings for toads, salamanders, lizards, snakes, and small mammals. Many other small wildlife species may create burrows in open areas to escape the heat or predators. For example, the flat-tailed horned lizard has been observed retreating to a burrow when daytime surface temperatures have approached 120°F (USDI BLM 2003b).

The flat-tailed horned lizard is of particular interest to the BLM and was designated as a sensitive species by the agency in 1980 (see Section 3.8, Special Status Species, for more discussion). This designation provides increased management attention to prevent population declines and habitat loss or degradation within the Salton Basin. Local populations of this lizard fluctuate greatly between years and because of winter/spring precipitation and production of annuals in spring; as a result, these populations are very susceptible to anthropogenic activities (USDI BLM 2003b).

Areas of the Salton Basin, including the proposed action area, are home to a variety of resident and migrating and wintering birds (USFS 2005). Resident birds, including the burrowing owl (*Athene cunicularia*) and Le Conte's thrasher (*Toxostoma lecontei*), feed on insects (i.e., grasshoppers, scorpions, large beetles, moths, and crickets). The burrowing owl also feeds on a vast array of small mammals, including mice, rats, voles, gophers, and bats.

The Salton Sea is a vital link in the Pacific Flyway as birds migrate along this coastal corridor. With more than 400 bird species recorded at the Salton Sea, approximately 100 of these species have established breeding populations (Patten et al. 2003). The Sonny

Bono Salton Sea National Wildlife Refuge, near Niland on the eastern shore, helps support the bird population and provides significant bird watching recreation opportunities. Migratory birds within the project area include Swainson's hawk (*Buteo swainsoni*), southwestern willow flycatcher (*Empidonax traillii extimus*), and California black rail (*Laterallus jamaicensis coturniculus*). The Salton Basin is important to these bird species as the area provides ample food sources during migrations north or south.

While the geothermal lease areas do not incorporate the Salton Sea, the proposed action area is within 2 miles of the western shoreline. Although there may not be suitable habitat for migratory birds within the proposed action area, its close proximity to the Salton Sea allows migratory birds to potentially transition through the area during migration.

A variety of mammal species are found in the surrounding habitat as well. These include desert pocket mice (*Perognathus* species), desert kangaroo rat (*Dipodomys deserti*), rabbits, and ground squirrels. In addition, large wildlife species such as mule deer (*Odocoileus hemionus*) seek the protection of the heavier vegetation. Mule deer rarely travel far from water or forage, and tend to bed down within easy walking distance of both. This species typically forage around dawn and dusk while bedding down in protected areas during mid-day. However, in the arid climates (such as the Salton Basin), mule deer may migrate in response to rainfall patterns.

Another larger wildlife species that may occur in the proposed action area is the coyote (*Canis latrans*). This opportunistic predator preys upon small mammals such as rabbits and squirrels, which comprise the bulk of its diet. Like the mule deer, coyotes tend to be more active during the early morning and sunset. This inactivity during the heat of the day exhibited by both the coyote and mule deer is a behavioral adaptation to the desert environment that conserves water and maintains the body temperature within livable limits.

3.8 Special Status Species

A literature search for special status plant and wildlife species known to occur within the project area and surrounding region was conducted by consulting the following lists: the California Department of Fish and Game's (CDFG's) California Natural Diversity Database, the California Native Plant Society's (CNPS's) Electronic Inventory, the U.S. Fish and Wildlife Service (USFWS) Threatened and Endangered Species System database, and the BLM's *California Sensitive Plants* and *Special Status Wildlife Species*.

3.8.1 Vegetation

The 12 plant species detailed below have the potential to occur in either the Truckhaven Geothermal Leasing Area or the surrounding area (Table 3-5).

Table 3-5 Sensitive Plant Species Potential for Occurrence in the Truckhaven Geothermal Leasing Area

Common Name *(Scientific Name)*	CNPS Status [a]	Flowering Period	Potential to Occur Onsite [b]
Harwood's milkvetch (*Astrgalus insularis* var. *harwoodii*)	2.2	January–May	High
Elephant tree (*Bursera microphylla*)	2.3	June–July	Moderate
Crucifixion thorn (*Castela emoryi*)	2.3	(April) June–July	Moderate
Pierson's pincushion (*Chaenactis carphoclina* var. *peirsonii*)	1B.3	March–April	High
Flat-seeded spurge (*Chamaesyce platysperma*)	1B.2	February–September	Low
Brown turban (*Malperia tenuis*)	2.3	March–April	High
Robison's monardella (*Monardella robinsonii*)	1B.3	(February) April–September (October)	Absent
Sand food (*Pholisma sonorae*)	1B.2	April–June	High
Orocopia sage (*Salvia greatae*)	1B.3	March–April	Moderate
Cove's senna (*Senna covesii*)	2.2	March– June	Moderate
Mecca aster (*Xylorhiza cognate*)	1B.2	January–June	High
Orcutt's woody-aster (*Xylorhiza orcuttii*)	1B.2	March–April	High

Sources: CNPS 1995, 2006; Skinner and Pavlik 1994.

Notes:

[a] **CNPS Designation**: 1A = plants presumed extinct in California; 1B = plants rare and endangered in California and throughout their range; 2 = plants rare, threatened, or endangered in California but more commons elsewhere in their range. **Threat Code**: 0.1: seriously endangered in California; 0.2: fairly endangered in California; 0.3: not very endangered in California. **Note**: According to CNPS, plants on Lists 1B and 2 meet definitions for listing as threatened or endangered under Section 1901, Chapter 10, of the California Fish and Game Code.

[b] As defined by the CNPS, the potential for occurrence for plant species is as follows: **High**: Both a historical record exists of the species within the project site or its immediate vicinity (approximately 5 miles) and the environmental conditions (including soil and elevation factors) associated with species presence occur within the project site; **Moderate**: either a historical record exists of the species within the immediate vicinity of the project site (approximately 5 miles) or the environmental conditions (including soil and elevation factors) associated with species presence occur within the project site; **low**: no records exist of the species occurring within the project site or its immediate vicinity (approximately 5 miles) or the environmental conditions (including soil type and elevation factors) associated with species presence are marginal within the project site; **Absent**: the species was not observed during focused surveys conducted at an appropriate time for identification of the species or environmental conditions (including soil and elevation factors) associated with species presence do not occur on site.

Harwood's milk-vetch (*Astrgalus insularis* var. *harwoodii*) is listed by the CNPS as a species in risk of endangerment (CNPS Status 2.2). Historically, this annual herb occurs in desert dunes and sandy or gravelly Mojave Desert scrub, between zero and 2,300 feet above mean sea level (AMSL), in elevation. Desert dunes occur within the Truckhaven Geothermal Leasing Area, and there is a recorded occurrence of Harwood's milk-vetch approximately 3 miles east of the proposed action area; therefore, this species has a high potential of occurring in the proposed action area.

Elephant tree (*Bursera microphylla*) is listed by the CNPS as a threatened species (CNPS Status 2.3). Historically, this perennial, deciduous tree occurs in Sonoran Desert scrub,

from 650 to 2,300 feet AMSL in elevation. Sonoran Desert scrub occurs in the proposed action area; however, the nearest recorded occurrence of this species is approximately 11 miles southwest of the Truckhaven area. Therefore, elephant tree has a moderate potential of occurring in the proposed action area.Crucifixion thorn (*Castela emoryi*) is listed by the CNPS as a threatened species (CNPS Status 2.3). Historically, this perennial, deciduous shrub occurs in Mojave Desert scrub, playas, and gravelly Sonoran Desert scrub, between 300 and 2,300 feet AMSL. Sonoran Desert scrub occurs in the proposed action area; however, the nearest recorded occurrence is approximately 25 miles northeast. Therefore, this species has a moderate potential of occurring in the Truckhaven Geothermal Leasing Area.

Pierson's pincushion (*Chaenactis carphoclina* var. *peirsonii*) is listed by the CNPS as a rare species in California (CNPS Status 1B.3). Historically, this annual herb occurs in sandy Sonoran Desert scrub, from approximately zero to 1,600 feet AMSL in elevation. Sonoran Desert scrub occurs in the proposed action area, and there is a recorded occurrence approximately 4 miles northwest of the proposed action area. Therefore, Pierson's pincushion has a high potential of occurring in the Truckhaven Geothermal Leasing Area.

Flat-seeded spurge (*Chamaesyce platysperma*) is listed by the CNPS as a species in risk of endangerment (CNPS Status 1B.2). Historically, this annul herb occurs in desert dunes and Sonoran Desert scrub, between 20 and 350 feet AMSL in elevation. Sonoran Desert scrub occurs in the proposed action area; however, the nearest recorded occurrence of flat-seeded spurge is approximately 10 miles southwest of the proposed action area. Thus, flat-seeded spurge has a low potential of occurring in the Truckhaven Geothermal Leasing Area.

Brown turban (*Malperia tenuis*) is listed by the CNPS as a threatened species (CNPS Status 2.3). Historically, this annual herb occurs in sandy Sonoran Desert scrub, between zero and 1,100 feet AMSL in elevation. Sonoran Desert scrub occurs in the proposed action area. While there are no recorded occurrences of brown turbans in the vicinity identified by the Californian Natural Diversity Database, the CDFG has observed this species within one mile of the project area. This species has a high potential of occurring in the Truckhaven Geothermal Leasing Area.

Robison's monardella (*Monardella robinsonii*) is listed by the CNPS as a rare species in California (CNPS Status 1B.3). Historically, this perennial rhizomatous herb occurs in pinyon and juniper woodland, in elevations between 2,000 and 5,000 feet AMSL. Pinyon and juniper woodland does not occur in the proposed action area; therefore, this species is considered absent in the Truckhaven Geothermal Leasing Area.

Sand food (*Pholisma sonorae*) is listed by the CNPS as a species in risk of endangerment (CNPS Status 1B.2). Historically, this perennial, parasitic herb occurs in desert dunes, from approximately zero to 650 feet AMSL in elevation. Desert dunes occur in the proposed action area, and there is a recorded occurrence of this species approximately 5 miles southeast of the proposed action area. Sand food has a high potential of occurring in the Truckhaven Geothermal Leasing Area.

Orocopia sage (*Salvia greatae*) is listed by the CNPS as a rare species in California (CNPS Status 1B.3). Historically, this perennial evergreen shrub occurs in Mojavean and Sonoran desert scrubs, between -100 to 2,700 feet AMSL in elevation. Sonoran Desert scrub occurs in the proposed action area; however, the nearest recorded occurrence of Orocopia sage is approximately 16 miles northeast of the proposed action site. This species has a moderate potential of occurring in the Truckhaven Geothermal Leasing Area.

Cove's senna (*Senna covesii*) is listed by the CNPS as a species in risk of endangerment (CNPS Status 2.2). Historically, this perennial herb occurs in Sonoran Desert scrub from approximately 700 to 3,500 feet AMSL in elevation. Sonoran Desert scrub occurs in the proposed action area, and, while the proposed action area is lower than the lowest recorded occurrence of Cove's senna, there is a recorded occurrence 11 miles west of the Truckhaven area. Therefore, this species has a moderate potential of occurring in the Truckhaven Geothermal Leasing Area.

Mecca aster (*Xylorhiza cognata*) is listed by the CNPS as a species in risk of endangerment (CNPS Status 1B.2). Historically, this perennial herb occurs in sandy Sonoran Desert scrub, between approximately 65 to 1,300 feet AMSL in elevation. Sonoran Desert scrub occurs in the proposed action area, and there is recorded occurrence of Mecca aster approximately 3 miles northwest of the proposed action area. This species has a high potential of occurring in the Truckhaven Geothermal Leasing Area.

Orcutt's woody aster (*Xylorhiza orcuttii*) is listed by the CNPS as a species in risk of endangerment (CNPS Status 1B.2). Historically, this perennial herb occurs in Sonoran Desert scrub, from approximately 65 to 1,200 feet AMSL in elevation. Sonoran desert scrub occurs in the proposed action area, and there are a number of recorded occurrences of Orcutt's woody aster in the immediate vicinity of the proposed action area. Therefore, this species has a high potential of occurring in the project area. All areas proposed for construction-related activities would be surveyed for this species prior to disturbance. In an event that the Orcutt's woody aster is present in the disturbance area, the CDFG would be consulted on suitable mitigation measures.

3.8.2 Wildlife

A sensitive species is considered to be a potential inhabitant of the project site if its known geographical distribution encompassed part of the project site or if its distribution is near the site and general habitat requirements of the species (such as roosting, nesting, or foraging habitat, or a permanent water source) are present. Eight sensitive wildlife species have the potential to occur either in the Truckhaven Geothermal Leasing Area or the surrounding area. Furthermore, the BLM requested that seven additional species also be addressed in this EIS (Table 3-6). A sixteenth species—the Gull-billed tern (*Sterna nilotica*)—is absent from the area and does not need to be addressed.

Table 3-6 Special Status Wildlife Species Potential for Occurrence in the Truckhaven Geothermal Leasing Area

Common Name (Scientific Name)	Status [a]	Potential to Occur in the Proposed Action Area [b]
Amphibians and Reptiles		
Colorado Desert fringe-toed lizard (*Uma notata notata*)	SC	High
Couch's spadefoot toad (*Scaphiopus couchii*)	SC	Low
Flat-tailed horned lizard (*Phrynosoma mcallii*)	SC	High
San Sebastian leopard frog (*Rana yavapaiensis*)	SC	Absent
Fish		
Desert pupfish (*Cyprinodon macularius*)	FE, SE	Absent
Birds		
Burrowing owl (*Athene cunicularia*)	BLM sensitive	Low
California black rail (*Laterallus jamaicensis corturniculus*)	ST	Absent
California brown pelican (*Pelecanus occidentalis californicus*)	FE, SE	Low
Golden eagle (*Aquila chrysaetos*)	SC	Moderate
Gull-billed tern (*Sterna nilotica*)	SC	Absent
Le Conte's thrasher (*Toxostoma lecontei*)	SC	High
Prairie falcon (*Falco mexicanus*)	SC	Moderate
Southwestern willow flycatcher (*Empidonax traillii extrimus*)	FE, SE	Low
Swainson's hawk (*Buteo swainsonii*)	ST	High
Mammals		
Pallid bat (*Antrozous pallidus*)	SC	Moderate
Pocketed free-tailed bat (*Nyctinomops femorosaccus*)	SC	Moderate

Sources: CDFG 2006b; USFWS 2007.

Notes:

[a] FE = Federal endangered; SE = State endangered; ST = State threatened; SC = California Species of Special Concern.

[b] The potential for occurrence ranking is based on the following criteria: **Absent** = species is restricted to habitats that do not occur within the project site or a focused survey failed to detect the species; **Low** = no recent or historical records exist of the species occurring within the project site or its immediate vicinity, and/or the habitats needed to support the species on the site are of poor quality; **Moderate** = either a historical record exists of the species within the immediate vicinity of the project site and/or the habitat requirements associated with the species occur within the project site; **High** = there is either a recent or historical record of the species occurring within the project site or its immediate vicinity and/or the diagnostic habitat requirements strongly associated with the species occur within the project site or its immediate vicinity.

Colorado Desert fringe-toed lizard (*Uma notata notata*) is a California-listed species of special concern that occurs from northeastern San Diego County, through the southern two-thirds of Imperial County to the Colorado River. This species is restricted to habitats of Aeolian sand in this area. Aeolian sand deposits occur within the proposed action area, and there are recorded occurrences of the Colorado Desert fringe-toed lizard within 5 miles of the proposed action area; therefore, this species has a high potential of occurring in the Truckhaven Geothermal Leasing Area.

Couch's spadefoot toad (*Scaphiopus couchii)* is a California species of special concern found in southeast California east of the Algodones Dunes and north to San Bernardino County. This species is typically observed in deserts and arid regions of grassland, prairie, mesquite, creosote bush, thorn forest, and sandy washes that are able to maintain temporary rain pools that last at least seven days for breeding and metamorphosis. Some of these conditions occur within the proposed action area; however, the nearest recorded occurrence of Couch's spadefoot toad to the proposed action area is approximately 20 miles northeast, across the Salton Sea. Therefore, this species has a low potential of occurring in the Truckhaven Geothermal Leasing Area.

The flat-tailed horned lizard (*Phrynosoma mcallii*) is a California species of special concern, found throughout most of the Colorado Desert, from northern Coachella Valley to northeastern Baja California, Mexico. In California, the flat-tailed horned lizard was designated a sensitive species by the BLM in 1980. In 1988, a petition was submitted to the California Fish and Game Commission to list the species as endangered. In 1989, the commission voted against the lizard as a threatened species (USFWS 1993). No final rule on the proposed listing was issued. In 2001, the USFWS published a notice of reinstatement of the 1993 proposed listing of the flat-tailed horned lizard as a threatened species and reopened the comment period on the proposed rule (USFWS 2001). The flat-tailed horned lizard listing as a threatened species was reinstated by the USFWS on December 6, 2005. A final determination of its status pursuant to the Federal Endangered Species Act was issued on June 28, 2006; the USFWS withdrew its proposal to list the flat-tailed horned lizard.

In 1994, several Federal agencies, including the BLM and the USFWS, signed a Memorandum of Understanding (MOU), a conservation agreement establishing a general framework for protecting the flat-tailed horned lizard. In 2003, the BLM signed the *Flat-tailed Horned Lizard Management Strategy*, which identified and prioritized numerous planning actions. The management strategy established five Management Areas (large blocks of habitat) to minimize surface disturbing and mortality causing activities. The management strategy also established the Ocotillo Wells Research Area, where scientific studies on this species are encouraged by the BLM.

The flat-tailed horned lizard occupies areas with fine, wind-blown sand deposits and has been recorded in several vegetative communities where this substrate occurs, such as creosote bush (*Larrea tridentata*), burro weed (*Franseria dumosa*), bur-sage, and indigo-bush (*Psorothamnus* species). The presence of flat-tailed horned lizards has been recorded within the proposed action area and throughout the surrounding area and has a high potential of occurring in the Truckhaven Geothermal Leasing Area.

San Sebastian leopard frog (*Rana yavapaiensis*) is a California species of special concern from the San Felipe Creek and Imperial Valley. Historically it was known to occur in slackwater aquatic habitats dominated by bulrushes (*Scirpus* species), cattails (*Tyhpha* species), and riparian grasses near or under an overstory of cottonwoods (*Populus* species) and willows (*Salix* species). This frog's presence was recorded in the San Sebastian Marsh approximately 30 years ago but has not been reported in that area since. Slackwater aquatic habitat does not occur within the proposed action area; therefore, this species may be considered absent from the Truckhaven Geothermal Leasing Area.

The desert pupfish (*Cyprinodon macularius*) is a Federal- and State-listed endangered species. This species has been recorded in a few saline pools along the Salton Sea's edge, some irrigation drains flowing into the Salton Sea, and portions of the Salt and San Felipe Creeks, which are tributaries to the Salton Sea. Aquatic habitat necessary to the desert pupfish does not occur in the proposed action area; therefore, this species may be considered absent from the Truckhaven Geothermal Leasing Area.

While the burrowing owl (*Athene cunicularia)* is found throughout California, it is listed as a California species of special concern. Historically, this species occurred in pasturelands and grasslands throughout California, but it has in recent times been found in agricultural and desert areas with open vegetation communities. Suitable habitat for burrowing owl exists in the proposed action area, but there have been no recorded sightings in the vicinity; therefore, this species has a low potential of occurring in the Truckhaven Geothermal Leasing Area.

California black rail (*Laterallus jamaicensis corturniculus*) is a State-listed threatened species. It is found throughout the San Francisco Bay Area, from the Sacramento and San Joaquin River Deltas to the coast, to Baja California, the Salton Sea, and the lower Colorado River. In the Salton Sea and along the lower Colorado River, north of Yuma, this species typically inhabits saltwater, brackish, and freshwater marshes. Marshes occur immediately south of the proposed action area but not in the Truckhaven area itself; therefore, this species may be considered absent from the Truckhaven Geothermal Leasing Area.

California brown pelican (*Pelecanus occidentalis californicus*) is a federally and State-listed endangered species. This species nests from the Channel Islands of Southern California, along the Baja California coast, to in the Gulf of California and coastal southern Mexico. While this species has been observed to nest at the Salton Sea in the past, populations gather at the Salton Sea during the post-breeding season and may be a transient through the proposed action area. Therefore, this species has a low potential of occurring in the Truckhaven Geothermal Leasing Area.

The golden eagle (*Aquila chrysaetos*) is a California species of special concern found in mountainous area. It was reported in the vicinity of the project area in 2004, although it has not been observed since. Therefore, there is a moderate potential for this species to occur in the proposed action area. In the event that it does occur in the project area, no activity would be allowed within 500 feet of its nesting site during breeding season.

The gull-billed tern (*Sterna nilotica*) is a California species of special concern. This summer resident of the U.S. is typically observed in salt marshes, estuaries, lagoons, and open coastal areas while foraging over marshes, pastures, farms, and plowed fields. None of these habitats occur within the proposed action area, and the nearest recorded occurrence of the gull-billed tern is approximately 7 miles east, along the Salton Sea. For these reasons, this species may be considered absent from the Truckhaven Geothermal Leasing Area.

LeConte's thrasher (*Toxostoma lecontei*) is a California species of special concern. This thrasher occurs primarily in open desert wash, desert scrub, alkali desert scrub, and desert succulent scrub vegetation communities in the Inyo County to the Mexican border; western and southern portions of San Joaquin Valley; and Joshua tree communities with scattered shrubs. Alkali desert scrub occurs within the proposed action area, and there are recorded occurrences of the LeConte's thrasher in both the project area and the surrounding area. Therefore, LeConte's thrasher has a high potential of occurring in the Truckhaven Geothermal Leasing Area.

The prairie falcon (*Falco mexicanus*) is a California species of special concern. This species occurs throughout the western U.S., in open, dry countryside while using grasslands, canyon lands, deserts, foothills, and dry mountain valleys for breeding and foraging. The prairie falcon nests on cliff sides, while home range estimates range from 10 to 50 square miles, with the core foraging area likely to be 10 to 15 square miles for mating pairs. There are no nesting sites or recorded occurrences in the vicinity of the proposed action area recorded with the California Natural Diversity Database. However, the CDFG has observed this species in the Truckhaven vicinity. Therefore, this species has a moderate potential to occur in the project area. If nesting pairs are observed in the vicinity of construction activities, these activities would be adjusted to avoid disturbance.

Southwestern willow flycatcher (*Empidonax traillii extrimus*) is a federally and State-listed endangered species. This Southern California resident is known to nest in willows, buttonbrush (*Cephalanthus occidentalis*), coyote brush (*Baccharis pilularis*) with a scattered overstory of cottonwood, and thickets of cottonwood. This flycatcher nests near surface water or the damp soil of intermittent streams that support riparian vegetation. As an insectivore, the southwestern willow flycatcher forages within and above dense riparian vegetation, conditions that do not occur in the proposed action area. However, the flycatcher may have been a transient through the area; therefore, the southwestern willow flycatcher has a low potential of occurring in the Truckhaven Geothermal Leasing Area.

Swainson's hawk (*Buteo swainsonii*) is a State-listed threatened species that spends the breeding season in California's Central Valley and spends the winter in Mexico and South America. Its territories in the Central Valley are riparian systems, next to suitable foraging habitats. These conditions do not exist within the proposed action area; however, Swainson's hawks may pass through the proposed action area en route to their wintering grounds. Therefore, there is a high potential that this species may temporarily occur in the Truckhaven Geothermal Leasing Area as it migrates to its wintering ground, but it is unlikely to reside in the area over the long-term.

The pallid bat (*Antrozous pallidus*) is listed as a California species of special concern. This species occurs throughout the Southwest, in rocky outcrops in regions where the dominant vegetation consists of scattered desert scrub. Daytime roosts are common in rock crevices and buildings and less common in mines, caves, and hollow trees. Pallid bats are intolerant of disturbance and may abandon a roost when disturbed, not returning for years. Rocky outcrops occur within the proposed action area, but the nearest recorded occurrence is approximately 10 miles southwest of the proposed action area. This species has a moderate potential of occurring in the Truckhaven Geothermal Leasing Area.

The pocketed free-tailed bat (*Nyctinomops femorosaccus*) is a California special concern species. This bat is known to occur in semi-arid desert lands in Southern California, south Arizona, southeast New Mexico, and the Big Bend area of Texas. Common roosts of this species are in caves, crevices in cliffs, and under roof tiles of buildings. Associated roosting conditions are present within the proposed action area, although the nearest recorded occurrence is approximately 10 miles southwest of the proposed action area. This species has a moderate potential of occurring in the Truckhaven Geothermal Leasing Area.

3.9 Cultural Resources

3.9.1 Prehistoric Background

The Colorado Desert, within which the Truckhaven Geothermal Leasing Area is located, has a documented cultural history that spans more than 10,000 years (Schaefer 2006). This cultural history is divided into six major periods: (1) Hypothetical Early Man (Malpais) (50,000 to 12,000 before present (B.P.)); (2) Paleoindian (San Dieguito) (12,000 to 7,000 B.P.); (3) Archaic (Pinto and Amargosa) (7,000 to 1,500 B.P.); (4) Late Prehistoric (Patayan) (1,500 to 300 B.P); (5) Ethnohistoric Tipai (Kumeyaay) and Cahuilla (300 B.P. to present); and (6) Historic Euro-American (300 B.P. to present).

Prehistoric Sites

Traces of Archaic period occupation are found in the proposed action area in the form of diagnostic projectile point sites and possibly some of the non-ceramic bearing sites, but the largest number of sites date to the Late Prehistoric and Ethnohistoric periods.

Most of the Late Prehistoric and Ethnohistoric period sites appear to be associated with the time during which the Colorado River inundated the Salton Trough to create ancient Lake Cahuilla. The lake was over 100 miles long, 35 miles wide, and over 300 feet deep. The height of the Colorado River Delta that formed a natural dam at the south end of the lake determined the maximum shoreline of Lake Cahuilla and created a variety of wetland habitats that attracted Native Americans from the surrounding areas to fish, hunt migratory waterfowl, and eat marsh plants such as cattail and bulrush roots. Eventually, siltation on the north side of the Colorado River Delta enabled the river to reestablish a route back to the Gulf of California. Each time this happened, Lake Cahuilla receded from the maximum shoreline to the bottom of the Salton Trough at elevations lower than 200 feet below sea level. After each infilling, Native Americans followed the receding shoreline to establish temporary fish camps and to use the emerging vegetation that colonized the drying lake bed. Some Archaic period Lake Cahuilla human occupation is

known, but most archaeological sites date to the last four phases of Lake Cahuilla infilling that occurred during the last 1,000 years. The final phase of inundation and recession occurred at the transition from the Late Prehistoric to the Ethnohistoric period between A.D. 1650 and 1700 (Laylander 1997; Schaefer 1994).

Prehistoric occupation of the Truckhaven area resulted in numerous archaeological resources. Trade and cultural exchange is evidenced by the presence of wonderstone, obsidian, and shell beads from the Gulf of California and the Pacific Ocean. Many of these sites also include circular sandstone, slab-lined structures with sand-filled, semi-subterranean floors. Most of these are dwelling structures, with the slabs used to anchor down brush superstructures. Occurring in groups of from one to 14 structures, they offer a special glimpse into the domestic lives and social organization of prehistoric peoples that less complex archaeological sites do not easily provide. Previous investigations indicate a large percentage of these structures contain little evidence from their short-term use, but several have been found with abundant household effects and other evidence of the past lifeways of specific domestic units. The best preserved of these structures have yielded datable material from the last phase of Lake Cahuilla. At least 12 sites contain these rock features but little else, suggesting several interpretations, including use as fish traps or earlier Lake Cahuilla phase structures that had become inundated. Several of the more typical V-shaped fish traps also occur in the Truckhaven project area, although they do not appear to be as common as in adjacent areas (Hines 2004; Schaefer 2006).

Other site types occurring in abundance include lithic scatters, scatters of mixed ceramic, lithic, and milling equipment, and hearth features. Rare sites include prehistoric trails, a mineral pigment quarry source, and ceramic scatters.

Four habitation sites and one artifact scatter contain documented evidence of human cremation burials that bear special significance and sensitivity for modern Native Americans. Presumably other habitation sites also contain human remains. While ceramic scatters are rare, at least one complex of pot drops has been interpreted as accumulated trail-side offerings, which may also bear additional levels of significance.

Prehistoric site conditions and integrity vary across the Truckhaven Geothermal Leasing Area. Many of the Lake Cahuilla shoreline sites with house structures are very well preserved, with evidence of subsurface deposits. These are among the most significant in the project area. Many of the artifact scatters, however, occur in heavily eroded or deflated areas around the major drainage basins and have low probability of subsurface remains. The Palm Springs Formation sandstone outcrops and badlands in the southeastern portion of the project area also appear to have poorer site preservation or lack archaeological sites. Several sites closest to SR-86 and Salton City have been impacted by road development, aggregate quarries, possible vandalism, and other forms of human disturbance. OHV activity is the most common impact to cultural resources throughout the area (Hines 2004).

3.9.2 Ethnohistoric Background

The Truckhaven Geothermal Leasing Area is situated at the boundary of two principal tribal groups – the Tipai to the south and the Cahuilla to the north. Ethnographic sources

suggest the area was principally occupied by the Tipai at contact, but these sources also indicate considerable interaction and co-residence by the Cahuilla and Tipai as far south as San Felipe Creek and Borrego Springs. Tribal boundaries also may have shifted through time, and today both Tipai and Cahuilla tribal groups consider the cultural resources of the general area as part of their cultural and historical patrimony.

Both groups also preserved knowledge of ancestral occupations along the shoreline of ancient Lake Cahuilla in their oral histories.

The Tipai (or Kumeyaay) families that lived in Imperial Valley and focused on desert living are collectively known as the Kamia. Members of the Hokan language family, they spoke a Yuman dialect that was related to the Kumeyaay of the Peninsular Ranges and coast, but with closest affiliations to the Yuman groups of the Colorado River Delta. They were organized into 10 to 11 non-localized, exogamous patrilineages. Many Kumeyaay living to the west were also members of these same lineages, leading anthropologists to conclude that the Kamia were, in essence, desert Kumeyaay who had assimilated many aspects of river Yuman culture, including horticulture. Lineage identification with specific locations was probably more related to settlement preferences of individual families who moved as lineage segments than of any lineage territoriality. The principal social unit was the nuclear family, for which the slab-lined houses found within the proposed action area are a likely material correlate. The Kamia practiced a mixed economy of horticulture and hunting and gathering. Mesquite (*Prosopis pubescens*) was the most important wild staple crop, just as with other groups in the Colorado Desert. Acorns were either obtained directly in the Peninsular Ranges or through trade with the Kumeyaay in exchange for cultigens, especially watermelons. The Kamia also procured baked and dried agave cakes from the Kumeyaay but otherwise did not participate in the early spring agave harvest. Those living in the proposed action area, however, had greater direct access to agave areas and other upland resources. Tule pollen and roots were gathered from sloughs, one favorite spot being Seven Wells on the east-west portion of the Alamo River south of the Mexican border (Hicks 1963; Gifford 1931).

The Cahuilla and related Takic ("Shoshonean") speakers are members of the Uto-Aztecan linguistic stock. Their closest principal territories to the proposed action area at the time of contact were in the Santa Rosa Mountains and in the northern Imperial Valley and Coachella Valley just north of the proposed action area. The Anza expedition in the 1740s recorded their visitation to the principally Tipai village at San Sebastian Marsh and apparent co-residence with the Tipai at Borrego Springs. Some dozen or more independent, politically autonomous land-holding patrilineal clans owned territory within their core area. Each of these territories ranged from the desert or valley floor to mountain areas, within which several biotic zones existed. Clans included one or more lineages, each of which had an independent community area which it owned within the larger clan area. In these areas, the larger villages were also the residences of a team of traditional political and religious leaders as well as the focus of ceremonial activities. While villages were occupied year-round, a large number of inhabitants would leave at specific times to exploit seasonally ripening foods in different environmental zones. Temporary camps would be established in these food collecting areas, and surpluses

would be transported back to the main village. Mountain Cahuilla would move to the upper desert areas and establish temporary camps to process agave in late winter-early spring, and then move to lower desert areas to harvest mesquite beans in the late spring. Conversely, the Desert Cahuilla ascended the mountains in the fall for the pinyon and acorn harvests (Bean 1972).

3.9.3 Historic Background

The Historic Euro-American period in the project area begins with the 1774–1775 and 1775–1776 Anza expeditions. These brought Spanish colonists from Sonora to coastal California via a route across the Colorado Desert at Yuma west to the foot of the Peninsular Ranges, then north and up San Felipe Creek to Borrego Valley, and from there northwest to the coast. The first detailed historic accounts of nearby Native Americans living at San Sebastian Marsh and Borrego Springs were made at this time. The Anza expedition opened what would become a branch of the Southern Immigrant Trail that brought Euro-Americans through the area during the Gold Rush and after. Historic activities in the Truckhaven Geothermal Leasing Area were minimal but included the U.S. Army Corps of Topographic Engineers' scientific and topographic survey in 1853 for a proposed transcontinental railroad route, the U.S. General Land Office's surveys in 1856, ranching and outlaw activities throughout the late nineteenth century, early automobile travel in the early twentieth century, oil and gas exploration from 1919 to 1950, limited military exercises during World War II, and the founding of Salton City and the Salton Sea Test Base in the 1950s. One other notable historic event was the formation of the modern Salton Sea between 1905 and 1906 (Apple et al. 1997; von Till Warren 1981).

3.9.4 Known Archaeological Resources

Human occupation created a substantial corpus of archaeological sites, 167 of which have been previously recorded within the Truckhaven Geothermal Leasing Area. The majority have been recorded during Class II and III studies by the CDPR for the OWSVRA environmental assessments (Arkush 1989; Hines 2002). More than 20 other surveys in the proposed action area have resulted from academic and avocational investigations, California Department of Transportation (Caltrans) improvements of SR-86, electrical and communication utility line corridors, aggregate quarries, and most recently for geothermal test wells. Perhaps 20 percent of the entire Truckhaven Geothermal Leasing Area has had some level of previous survey. The majority of more than 120 prehistoric archaeological sites in the Truckhaven Geothermal Leasing Area are located along the maximum shoreline of Lake Cahuilla or at recessional beach lines where local topography facilitated establishment of fishing camps (Arkush 1989; Hines 2002, 2004; Gruver 2004). Of these, more than 40 are habitation sites with midden deposits, hearth or cooking features, fish and animal bone, and a variety of artifact types, including ceramics, flaked stone, and milling tools.

Sixteen sites are historic, including two exploratory oil wells, two military targets, and three trash scatters or building remains. Eight historic sites are road segments documented on the 1856 General Land Office survey maps but which, technically, have

not been verified in the field as extant historic sites. Three sites have both historic and prehistoric remains, two of which are habitation sites (Schaefer 2006).

3.10 Paleontological Resources

Paleontological resources are the mineralized (fossilized) remains of prehistoric plants and animals as well as the mineralized impressions (trace fossils) left as indirect evidence of the form and activity of such organisms. These resources are located within sedimentary rocks or alluvium at Truckhaven and are considered to be non-renewable. Paleontological resources believed to be older than recorded history and/or older than 5,000 years B.P. Buried late Holocene biotic remains are often considered fossils by researchers (Jefferson 2007). In general, paleontological resources are considered significant if:

- They provide information regarding the evolution of organisms;
- They provide information regarding the relationships between plants and animals;
- They demonstrate unusual or spectacular circumstances in the history of life; or
- They are relatively rare; in danger of destruction through natural forces, human development, vandalism, or commercial exploitation; and not found in other geographic locations.

The depositional history within the Truckhaven Geothermal Leasing Area includes Late Holocene lacustrine deposits from ancient lakes that once filled the Salton Trough. These deposits may contain paleoclimatic information including variations in water temperature, localized habitats, generalized ecological conditions, and the salinity of extinct lakes (Jefferson et al. 2006).

The ABDSP, immediately west of the Truckhaven Geothermal Leasing Area, has an exceptional fossil record covering the last 20 million years (Jefferson 2007). Over 550 different types of fossil organisms have been identified in the ABDSP (Jefferson et al. 2006). These fossil remains range from microscopic plant pollen and spores to mammoth elephants. Within the Truckhaven Geothermal Leasing Area, fossil vertebrate remains have been recovered from near Pole Line Road, from the Arroyo Diablo/Borrego Formation (Jefferson 2007).

Microfossils, such as forams, pollen, ostracods, gastropods (snails), clams, oysters, plant fragments, and petrified wood, can be expected within the lease area (Jefferson et al. 2006; Kirby 2005). Most of the vertebrate fossils found in the ABDSP are found in the Palm Spring Group and the Ocotillo Formation. Jefferson (2007) states: “Fossiliferous geological units of the Palm Spring Group, the Arroyo Diablo, Borrego and Brawley Formations (Kirby 2005) are well exposed within the [Truckhaven Geothermal Leasing Area].”

3.11 Visual Resources

3.11.1 Visual Resource Management Classes

The overall objective of BLM visual resource management is to manage public lands in a manner that will protect the quality of the visual (scenic) values in accordance with Section 102(a)(8) of the Federal Land Policy and Management Act (FLPMA). The BLM Visual Resource Management (VRM) system is a methodical approach to inventorying and managing the scenic resources of the public lands.

Within VRM Class III, BLM management objectives allow for moderate modifications of the character of the landscape:

> Class III Management Objectives: To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape (USDI BLM 1995).

Within VRM Class IV, BLM management objectives allow for extensive modifications of the character of the landscape:

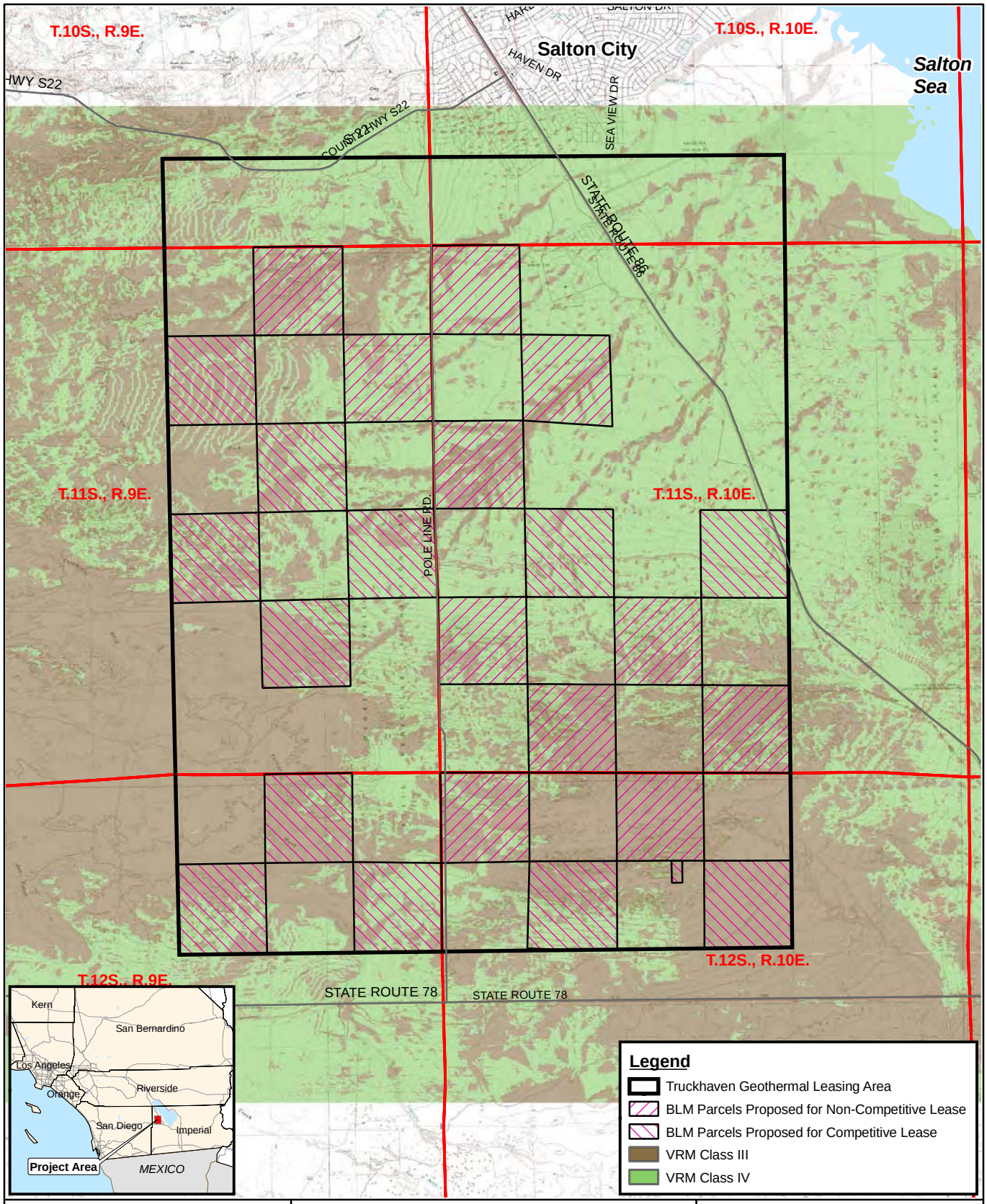
> Class IV Management Objectives: Provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements (USDI BLM 1995).

The entire Truckhaven Geothermal Leasing Area is not currently managed under the BLM VRM objectives. However, a field visit in August 2006 revealed the site to be characterized as VRM Class IV in the gently rolling topographic areas and Class III in the areas of significant topographic relief (Figure 3-3).

3.11.2 Landscape Character

The most visibly apparent human-made structures and uses in the Truckhaven Geothermal Leasing Area are an Imperial Irrigation District (IID) transmission line that bisects the proposed action area, an IID H-frame structure east of the proposed action area, the County landfill on the northwest corner of the proposed action area, SR-78, SR-86, and the extensive OWSVRA. The IID transmission line has a capacity of 161 kilovolts (kV) and the H-frame structure has a capacity of 230 kV (Ambriz 2007).

Scenic values seen along SR-78 have led Caltrans to designate this roadway as eligible for designation as a scenic highway (Caltrans 2006). Though not officially designated, this road still carries motorists traveling it for the sole purpose of scenery enjoyment.



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International Specialists in the Environment
Seattle, Washington

TRUCKHAVEN GEOTHERMAL LEASING AREA

FINAL EIS

Figure 3-3
VRM CLASSIFICATION

Job Id:

Date: 12/28/2006

GIS Analyst: avh

Map Source Information: USGS Topographic Quadrangle 1:24,000. Terraserver.

Due to the extensive OHV use throughout the proposed action area, some scenic qualities of the landscape have been diminished. Evidence of the OHV use includes extensive road and trail networks that contrast with the natural color of the surrounding landscape, tire tracks visible nearly everywhere, slide slope trails carved on steep slopes that causes landform contrast, overly sparse vegetation due to ground compaction, and litter in some places. OHV use is officially allowed at the OWSVRA, but some users ride off the State parcels and enter BLM and other private parcels within the proposed action area.

Visibility from sensitive viewpoints within the project area was mapped and is shown in Figure 3-4. Distance zones of foreground (0 to 0.5 miles), middle ground (0.5 to 1.5 miles) and background (1.5 to 5 miles) were mapped from sensitive viewpoints that included SR-78 and SR-86 and Pole Line Road, which parallels the IID 161-kV transmission line. Despite the mostly flat terrain, subtle undulations in the topography result in approximately 52 percent of the proposed action area being visible from sensitive viewpoints. The remaining 48 percent of the proposed action area is not visible from sensitive viewpoints because of several topographic obstructions and protrusions that block views of portions of the lease area. The area containing the existing geothermal well owned by Philips Petroleum cannot be seen from SR-78. The existing well is sited in a flat area that is nearly 100 percent visible from both Pole Line Road and SR-86, which are both low-sensitivity viewpoints.

3.12 Lands and Realty

3.12.1 Regulatory Framework

Federal Legal Authorities

The governing laws and applicable management plans for BLM-managed lands are detailed in Section 1.6 and include:

- Federal Land Policy and Management Act of 1976, as amended (P.L. 94-579);
- California Desert Protection Act of 1994 (P.L. 103-433); and
- California Desert Conservation Area Plan of 1980, as amended (USDI BLM 1999).

State School Lands

Portions of the property within the Truckhaven Geothermal Leasing Area are known as “school lands” and are under the jurisdiction of the California State Lands Commission (CSLC). Statewide, the CSLC manages 1,190 fee-owned parcels containing a total of approximately 469,250 acres of school lands and the reserved mineral interests on approximately 790,000 acres of school lands where the surface estate previously has been sold. School lands were placed into a statutory trust in 1984 by the California State Legislature under the School Land Bank Act, which created the School Land Bank Fund, and designated the CSLC as trustee of the fund. Pursuant to Public Resources Code Section 6217.5, all net revenues derived from the use of school lands (for example, royalties, rents, and interest generated from mineral leasing or geothermal development)

are deposited into the State Treasury to the credit of the Teachers' Retirement Fund, which benefits the State Teachers' Retirement System.

Imperial County

Lands under private ownership exist within and adjacent to the proposed action area boundary. Applicable management plans and policies for these lands include the Imperial County General Plan (Imperial County 2003) and Imperial County zoning regulations. As Imperial County has no direct land use jurisdiction over public lands, neither the General Plan nor Imperial County zoning regulations are directly applicable to activities proposed on public lands. However, private lands scattered throughout and adjacent to the project area are under Imperial County's jurisdiction and therefore would be subject to the General Plan and County ordinances if they are used in any future geothermal development on Federal lands (Imperial County 2007).

If development is similar to the flash/binary plant at East Mesa, the County would require conditional use permits for fresh water wells, building permit reviews, plan check for plant facilities, subsidence surveying and other duties devolved to the County (Imperial County 2007).

Figure 3-5 presents a land use map that depicts existing land use development patterns within the Truckhaven Geothermal Leasing Area and surrounding region.

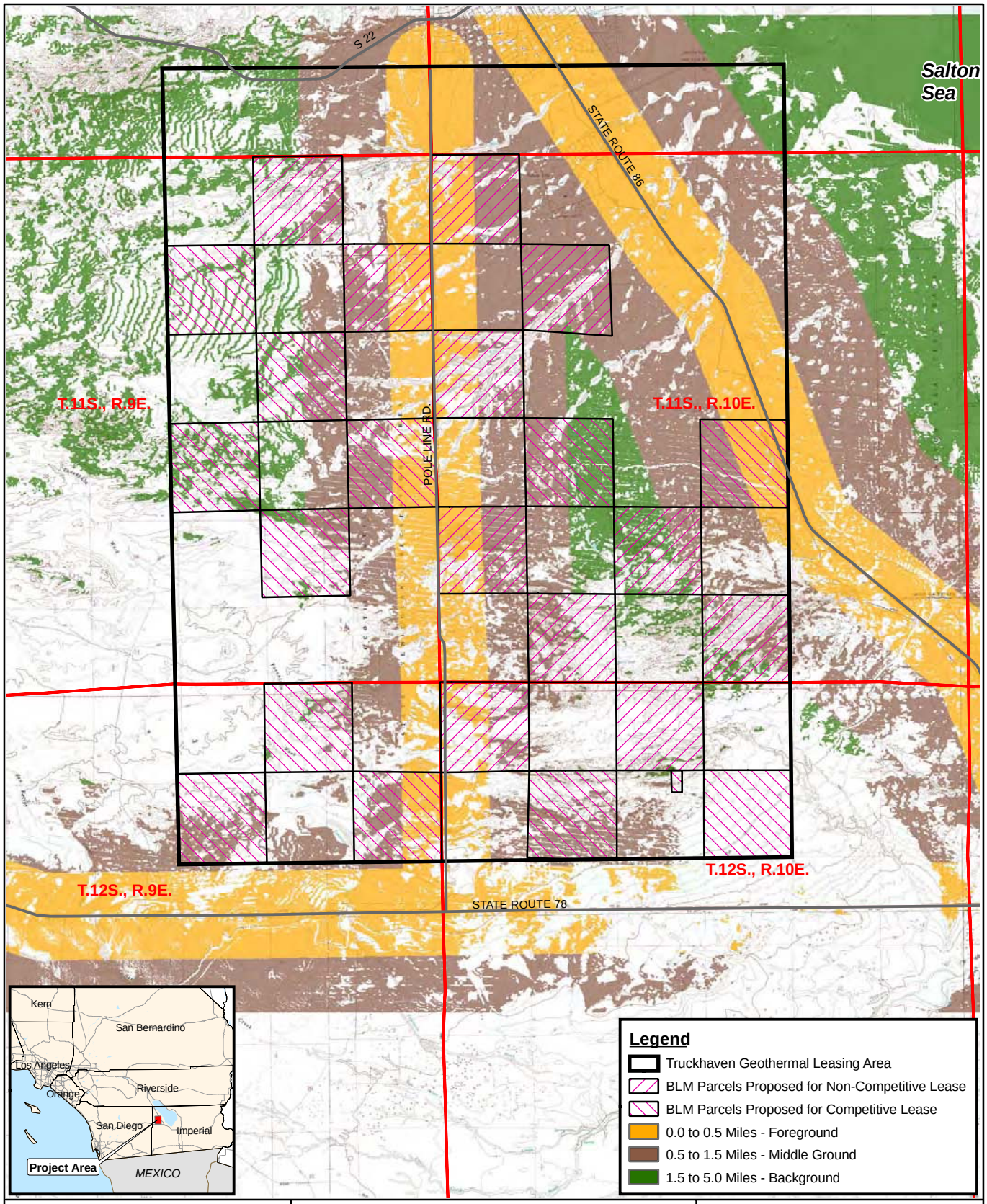
3.12.2 Land Status

The Truckhaven Geothermal Leasing Area encompasses 63 sections or approximately 40,320 acres. Of these, approximately 22½ sections (14,400 acres) are BLM surface and subsurface. The surface estate of the north half of Section 12, T.11S., R.9E. SBM is privately owned with a retained Federal interest in the subsurface (mineral) estate. Both the surface and mineral estates of the south half of the section remain in Federal ownership. BLM has pending noncompetitive lease applications on 11 sections of land totaling 7,051 acres.

The remainder of the Truckhaven area is composed of private lands or lands owned by the State of California. The State owns the surface and mineral estate on approximately 7 sections (4,344 acres) , and the mineral estate in one other section (473 acres) where the surface is private. The 4,817 acres where the CSLC has jurisdiction for leasing geothermal resources are distributed among the tracts listed in Table 3-7.

Other State-owned lands include those under the jurisdiction of the California Department of Parks and Recreation (CDPR) and Caltrans along Highway 86. Currently, the CDPR (Ocotillo Wells State Vehicular Recreation Area) has surface management jurisdiction over 3,628 acres.

There are no Tribal Lands within or immediately adjacent to the Truckhaven Geothermal Leasing Area.



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ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

TRUCKHAVEN GEOTHERMAL LEASING AREA

FINAL EIS

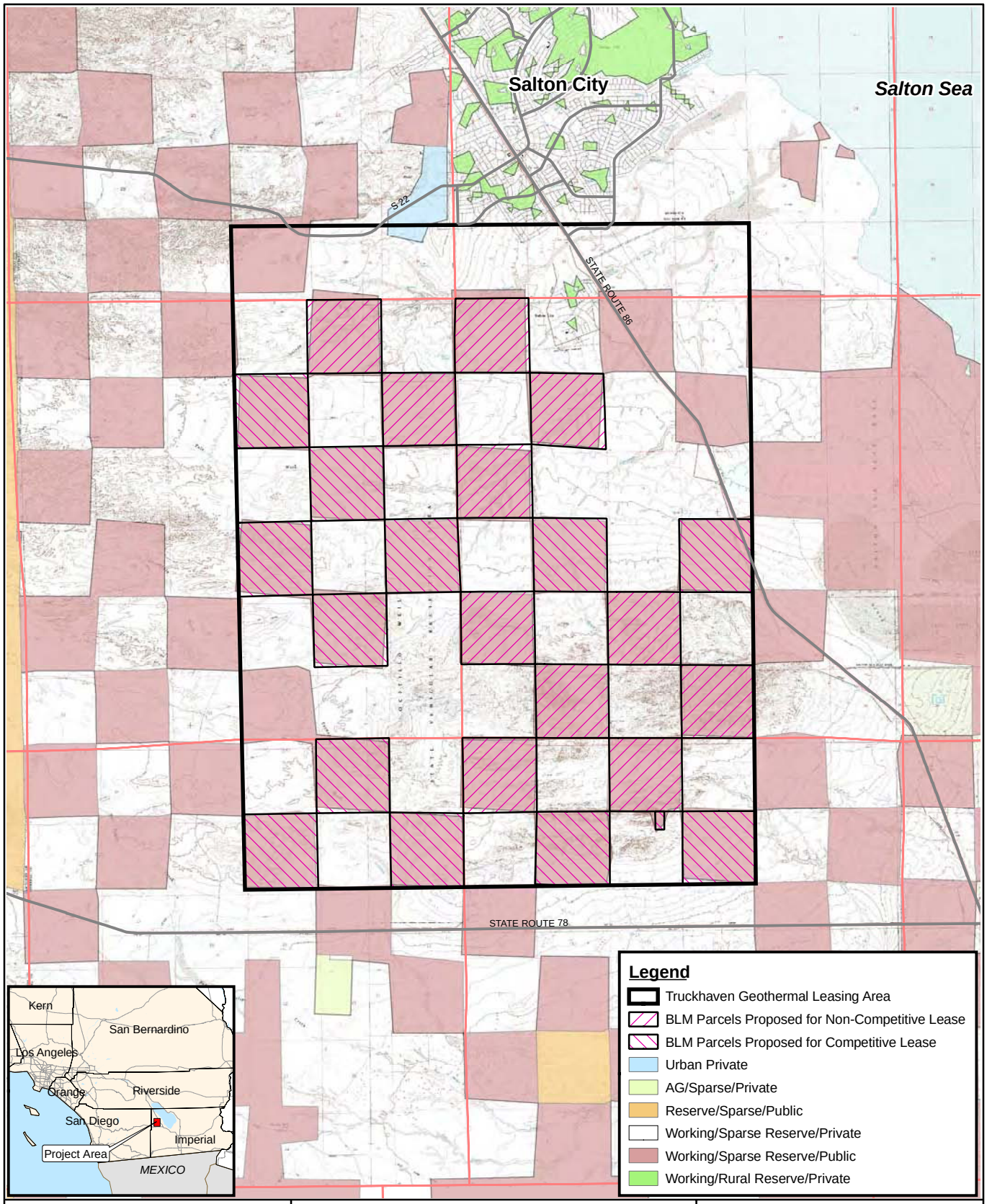
Figure 3-4
VISIBILITY FROM SENSITIVE VIEWPOINTS - STATE ROUTE 78 AND STATE ROUTE 86

Job Id:

Date: 12/28/2006

GIS Analyst: avh

Map Source Information: USGS Topographic Quadrangle 1:24,000. Terraserver.



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TRUCKHAVEN GEOTHERMAL LEASE APPLICATION

FINAL EIS

Figure 3-5
LAND USE MAP

Job Id:

Date: 10/24/2006

GIS Analyst: avh

Map Source Information: USGS Topographic Quadrangle 1:24,000. Terraserver.

Table 3-7 Mineral Lands under Jurisdiction of CSLC within Truckhaven Geothermal Leasing Area

Township	Section	Acres
T10S., R9E	34	640
T10S., R9E	35	543
T10S., R9E	36	473
T11S., R9E	34	640
T11S., R9E	36	600
T11S., R10E	4	641
T11S., R10E	10	640
T11S., R10E	16	640
Total		**4,817**

All BLM lands within the Truckhaven area are classified as suitable for conveyance under the Recreation and Public Purposes Act. The CDPR has filed a Recreation and Public Purposes Act application for the classified lands.

3.12.3 Existing Facilities and Corridors

Four sections within T.11S., R.10E. SBM contain other rights-of-way. Sections 6, 18, and 30 in T.11S., R.10E. SBM contain a 50-foot right-of-way to IID for a transmission line (R-139). IID is a public utility that provides electricity through the operation of nine hydroelectric generation plants, a 180-megawatt steam plant, eight gas turbines, and an eight-unit diesel plant. The transmission right-of-way supports a 92-kV line that links IID and Southern California Edison. This allows Imperial Valley access to the rest of the southwestern power grid and establishes a strong path to export geothermal energy from Imperial Valley.

Section 22 in T.11S., R.10E. SBM contains a 400-foot right-of-way held by Caltrans/Federal Highways Administration for SR-86 and ditches and dikes. SR-86 is generally a north-south route and begins near Heber as a two-lane conventional highway and ends at the Riverside County line as a four-lane expressway. In Riverside County, SR-86 joins SR-111 which then connects with Interstate 10 (see Section 3.18 Transportation for more information on roads and traffic).

Adjacent to the Truckhaven Geothermal Leasing Area are the Salton Sea Airport and S-22 (Borrego Salton Seaway). The airport exists on Section 5 of T.11S., R.10E. SBM. The Imperial County General Plan approved expansions in October 1994 that would have increased the size of the airport; however, these improvements have not yet been undertaken. S-22 approaches the northwest corner of the Truckhaven area at Sections 34 and 35 of T.10S., R.9E. SBM. These lands are under State/private ownership. S-22 is a two-lane route classified as a “Major Collector” in the General Plan.

3.13 Human Health and Safety/Hazardous Materials

The Salton City Class III Municipal Solid Waste Management Facility is owned and operated by the Imperial County Public Works Department and is located on BLM-administered land within the Truckhaven Geothermal Leasing Area (CEPA 2006). This waste management facility is regulated under the waste discharge requirements in Board Order No. R7-2006-0007, which incorporates the laws and regulations from the California Water Code and combined State Water Resources Control Board/California Integrated Waste Management Board Regulations, Division 2, Title 27, and Federal regulations under the Resource Conservation Recovery Act. The facility is located in the northern half of Section 12, T.11S, R.9E. SBM and occupies approximately 320 acres with a waste management unit occupying 7.8 acres. The current total solid waste capacity of the facility is approximately 851,800 tons, with a volume capacity of over 2.5 million cubic yards. The fill rate at the facility is less than 0.5-tons per day (West Shores/Salton City 2000). This landfill is permitted to accept solid waste only and is prohibited from accepting hazardous waste, radioactive waste, geothermal wastes, sewage sludge, and liquid waste. According to the Colorado River Basin Regional Water Quality Control Board (Region 7), there are no other known waste sites within the proposed action area (Ochs 2006).

There are no known abandoned mine shafts or tunnels on BLM-administered land within the Truckhaven area (Hagerty 2006).

According to BLM staff, limited illegal dumping occurs in the Truckhaven area (in the form of a few small can dumps). Organized target shooting also takes place, and there may be occasional recreational shooting. According to Region 7 of the Regional Water Quality Control Board, there are no known underground storage tanks, above-ground storage tanks, hazardous materials, spills, pesticides, fuels, etc., specific to the Salton Sea Airport and BLM lands within the proposed action area. There are no records of crop dusters storing chemicals at the airfield in the proposed action area.

There are two inactive Formerly Used Defense Sites: Winona Bomb Target Sites No. 1 and 2, located on BLM-administered lands within the Truckhaven Geothermal Leasing Area (CDTSC 2006). Winona Bomb Target Site No. 1 is located in the southern half of Section 12, T.11S., R.9E. SBM, approximately 4 miles southwest from the center of Salton City at SR-86 and south of the municipal landfill. The Eleventh Naval District acquired this 640-acre site from the Department of Interior by Letter Permit, dated August 15, 1944. This site was used as a low-level rocket target and was declared surplus in 1946. According to historical information, site restoration was solely to involve removal of the target by station labor. During a site visit in 1993, ordnance was observed at six locations and included a 2-inch shell, blasting caps/fuses, 50-caliber belt clips, and practice bomb fragments (U.S. Army 1995). Neither the extent nor the potential hazard of the ordnance and explosive waste has been determined.

The Winona Bomb Target Site No. 2 is located in Section 10, T.11S., R.9E. SBM, approximately 5 miles south of the center of Salton City at SR-86 (CDTSC 2006). The Eleventh Naval District acquired temporary use of this 640-acre site from the Department

of the Interior by Letter Permit, dated August 15, 1944. This site was used for dive-bombing, strafing practice, and low-level rocket target and declared surplus in 1946. The site is vacant and unimproved desert property. This property is known or suspected to contain military munitions and explosives of concern (e.g., unexploded ordnance), and hence may present an explosive hazard. According to the Imperial County Certified Unified Program Agency, there are no other known hazardous sites within the proposed action area. According to the Imperial County Department of Environmental Health, there are no known recorded spills within the project area (Guillen 2006).

A portion of the Truckhaven Geothermal Leasing Area is within the Navy's Range Safety Zone (RSZ) C. A range safety zone prioritizes relative hazard risks and safety requirements with respect to noise, drop hazard, and aircraft accident potential. RSZ C is intended to provide an adequate area of protected space in which military training exercises can be safely conducted without interference from general aviation traffic. There are also height and population density concerns which need to be controlled in RSZ C. Considering the altitude of the aircraft and the type of maneuver the aircraft is engaged in, less danger exists to surface activities in this area, although certain activities must be restricted (U.S. Navy 1997). The following is a legal description of the Truckhaven areas that are within RSZ C:

- T.11S., R.9E.; SBM, Sections 3, 10, 11, 14, 15, 22-27, and 34-36;
- T.11S., R.10E.; SBM, Section 31;
- T.12S., R.9E.; SBM, Sections 1-3, and 10-12;
- T.12S., R.9E.; SBM, Sections 6-8.

These parcels generally lie in the southern and western half of the proposed action area and encompass 11 of the 23 BLM parcels in the Truckhaven Geothermal Leasing Area. According to the MOU between the Navy and the BLM (U.S. Navy 1997), the BLM is required to notify the Navy of any actions on its lands in these areas that may have an effect on current or potential uses. The height restriction in RSZ C is a maximum of 200 feet (Bjornstad 2006). The BLM has the sole right to grant rights of way, leases, or permits within RSZ C; however, the BLM will contact the Navy for its concurrence on the adequacy of the protective stipulations to be included in the granting documents within this area before any rights or privileges are granted.

3.14 Energy and Minerals

3.14.1 Energy

Existing energy resources in Imperial County consist of geothermal and hydroelectric resources, and biomass available for thermal energy generation.

Imperial County contains one of the potentially largest liquid-dominated geothermal resources in the world. The geothermal resources in the County are the hottest and are located at relatively shallow depths. The liquid-dominated geothermal resource can provide a relatively clean source of power as compared to other energy sources (e.g., coal and petroleum reserves) (Imperial County 2003).

The geothermal energy industry has become an important part of the County's industrial base. The County supports and encourages the development of geothermal resources in a manner compatible with the protection of agricultural and environmental resources. The County implements this goal by providing leadership, staff liaison with other regulatory and permitting agencies, and an effective set of plans and standards to facilitate the development process.

Currently, geothermal energy is the only commercially viable energy resource in the Truckhaven Geothermal Leasing Area. BLM currently has five noncompetitive geothermal lease applications on file.

There are no known fluid or solid mineral energy reserves in Imperial County, although exploratory drilling for oil and gas has taken place in the Truckhaven area. IID imports these fuels for use at the El Centro Steam Plant, the Brawley Diesel Plant, the Rockwood Plant, and Coachella Station. In 1988, approximately 62 percent of electricity generated by IID was with the use of imported fossil fuels.

In 1936, IID entered into the electrical power business as a public utility. After construction of the All-American Canal, low-cost hydroelectric energy became a byproduct of the irrigation system available to the Imperial Valley. As electrical needs have increased, IID has imported additional sources of energy to supplement the hydro-generated power.

IID operates nine hydroelectric generation plants, a 180-MW steam plant, eight gas turbines, and an eight-unit diesel plant. The Coachella Valley Substation, placed in service in June 1986, is the key link between IID and Southern California Edison. A 230-kV transmission line constructed in 1988 allows Imperial Valley access to the rest of the southwestern power grid and establishes a path to export geothermal and other alternative energy (such as biomass purchased by Southern California Edison) from Imperial Valley.

Power generated by the hydraulic force of water (hydroelectric generation) is a relatively low-cost means of generating electrical power with minimal adverse impacts on the environment when the resource is available. In normal rainfall years, nearly 16 percent of California's electrical generating capacity comes from hydropower.

The first hydroelectric plants on the All-American Canal were completed at Drops 3 and 4 in 1941. The hydroelectric facility at Drop 2 was installed in 1953. The Pilot Knob Plant was built on a bypass channel between the All-American Canal and the Colorado River, near Yuma, Arizona, and went into operation in 1957. The Drop 5 installation was completed in 1982; the Drop 1 and East Highline Turmant Hydro Plants were opened in 1984. Hydroelectric power from the All-American Canal produces approximately 85 MW (CEC 2002). Pilot Knob has 55 feet of hydraulic head and can produce up to 33 MW (U.S. Bureau of Reclamation 2007). Capacity for the other small plants was not readily available.

Imperial County has approved development of two power plants to generate 33 MW (gross) of electricity with use of agricultural waste products (biomass). Zoned in a part of

the County for heavy industrial use, the plants are located together north of the City of Imperial on the west side of SR-111, south of Keystone Road.

An extensive source of energy is available in Imperial County in the form of sunlight (solar generation). Photo-voltaic cells power a variety of items from calculators to remote telecommunications stations and water pumps. It has been estimated that solar power could eventually produce 10 percent of the United States energy supply. No commercial power generation of solar energy presently exists in the County.

3.14.2 Minerals

A wide variety of minerals are found throughout Imperial County. Gold, gypsum, sand, gravel, lime, clay, and stone have the highest economic value and are presently extracted for profit in the County. Industrial materials are also readily available, including kyanite, mineral fillers (clay, limestone, sericite, mica, and tuff), salt, potash, calcium chloride, manganese, and sand. The managed use of the valuable mineral deposits is important for regional economic stability. Mining operations are restricted to the relatively few locations where mineral deposits are suitable for extraction. In the past, minor amounts of sand and gravel were mined in the Truckhaven Geothermal Leasing Area. These operations have expired, and no other mines are operating or proposed at present.

3.15 Recreation

3.15.1 Regional Setting

The BLM is entrusted with the multiple use management of natural resources on public land, in accordance with the FLPMA. As part of multiple use management under the FLPMA, public land must be managed for outdoor recreation and natural, scenic, scientific, and historical values. (Policy set by Section 102(a)(13) of the FLPMA also recognizes the nation's need for domestic sources of minerals, timber, food and fiber from the public lands.) BLM land has a variety of uses, including recreation. General recreation activities on BLM-administered land in the CDCA include hobby prospecting, sightseeing, photography, hunting, painting, bird watching, biking, camping, picnicking, hiking, OHV use, and wildlife viewing (USDI BLM 1999). The California Desert attracts several million visitors annually, participating in a wide range of recreational activities as noted above. The sheer landscape diversity provides a variety of settings in which to enjoy the desert's natural beauty and solitude away from the urban settings of Southern California.

The California Department of Parks and Recreation (CDPR) manages the public land within the Truckhaven Geothermal Leasing Area as a majority of the proposed action area lies within the OWSVRA (Figure 3-6). Although BLM owns 23 sections of land in the Truckhaven Geothermal Leasing Area that are within the OWSVRA, the CDPR administers those BLM parcels via a MOU between the two agencies (Appendix D). Although the MOU allows the State to administer access to these BLM lands, it does not grant the State the authority to approve or reject the pending Federal lease applications for those parcels.

Designated by the FLPMA in 1976, the CDCA is a 25-million acre expanse of land in Southern California. About 10 million acres are administered by the BLM. Congress directed BLM to prepare and implement a comprehensive, long-range plan for the management, use, development, and protection of the public lands within the CDCA. The plan is based on the concepts of multiple use, sustained yield, and maintenance of environmental quality. The plan establishes goals for protection and for use of the Desert. It designates distinct multiple use classes for the lands involved, and it establishes a framework for managing the various resources within these classes. These lands are managed in a controlled balance between higher intensity use and protection. A wide variety of uses, such as mining, livestock grazing, recreation, energy, and utility development, are allowed. Any damage that permitted uses cause must be mitigated (USDI BLM 1999). In addition to OHV uses, the Truckhaven area of the CDCA has several unmanaged hiking trails within the area, as well as the Truckhaven Trail, and several primitive campgrounds with no facilities that can be accessed only by foot or OHV.

Regulatory Framework

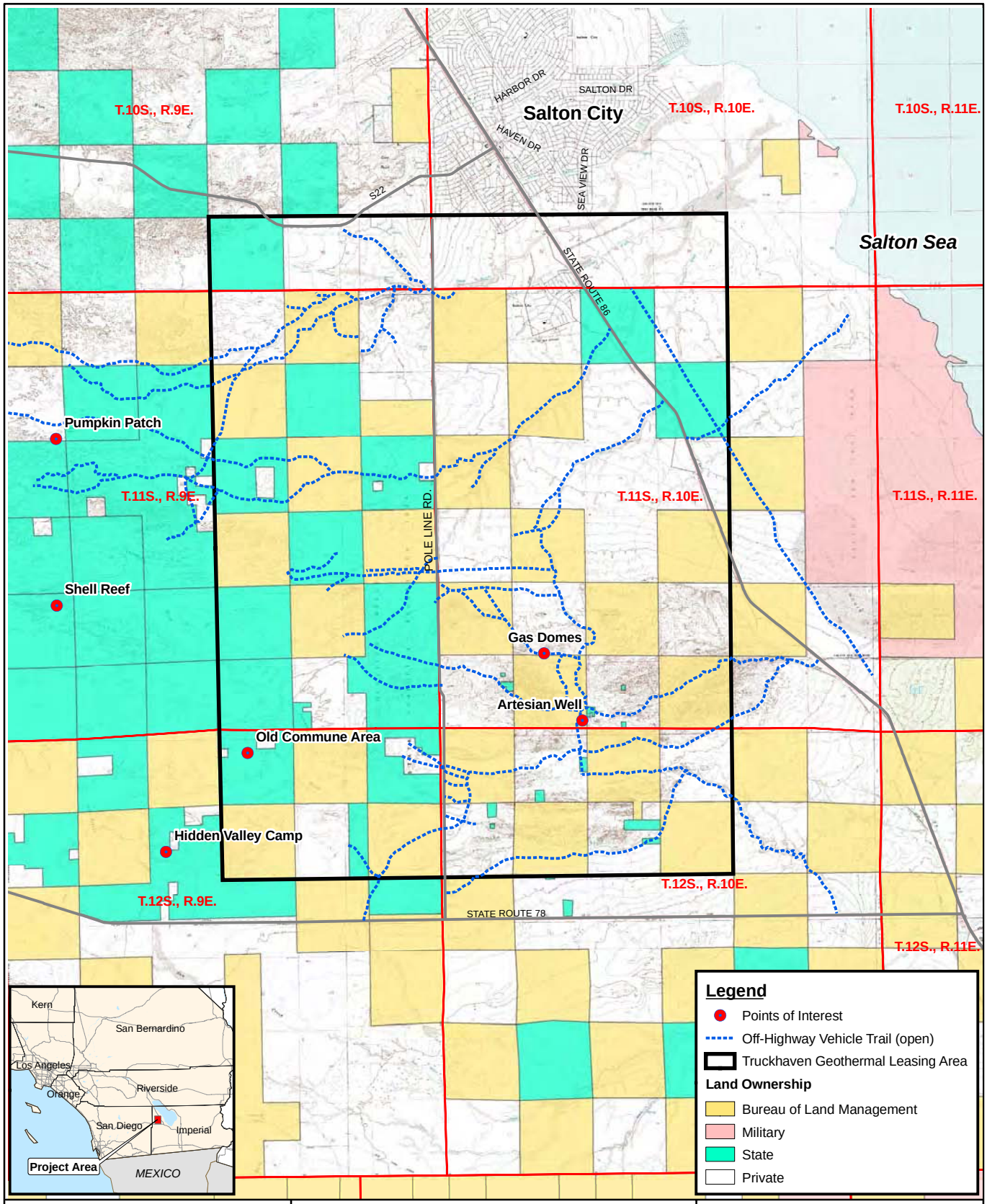
Since the CDCA's designation, the BLM lands have been managed according to mandates set forth in FLPMA Section 601. Among the policies in effect for the CDCA is the following, which states:

> . . .the use of all California desert resources can and should be provided for in a multiple use and sustained yield management plan to conserve these resources for future generations, and to provide present and future use and enjoyment, particularly outdoor recreation uses, including the use, where appropriate, of off-road recreational vehicles . . . [90 Stat. 2743, Sec. 601 (a)(4)].

Section 601(d) also directed the BLM to develop a land use plan, prepared under Section 202 of FLPMA, which was originally completed in 1980 and amended many times since to guide the management of the CDCA under the principles of multiple use and sustained yield, including resource use and mineral development. The plan divided all public land within the CDCA, including the parcels in the Truckhaven Geothermal Leasing Area, into multiple use classes that stipulate, among other things, whether different areas can be used for motorized recreation and motorized access and the intensity of that use. Because these classes are legally binding, unless amended through the public process, the BLM must manage the parcels in the proposed action area according to the class prescriptions. The Truckhaven Geothermal Leasing Area is designated a Class M or moderate use.

In 2003, BLM completed the Western Colorado Route of Travel Plan, which updated the route designations for the western portions of the CDCA, including lands within the Truckhaven Geothermal Leasing Area.

BLM has no developed campgrounds or facilities within the project area. The OWSVRA is open for camping, and the BLM property administered by CDPR is used similarly.



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Seattle, Washington

TRUCKHAVEN GEOTHERMAL LEASING AREA

FINAL EIS

Figure 3-6
RECREATION

Job Id:

Date: 12/28/2006

GIS Analyst: avh

Map Source Information: USGS Topographic Quadrangle 1:24,000. Terraserver.

Truckhaven area is not designated a Special Recreation Management Area, and the CDCA Plan does not call for the area to receive any special management attention.

3.15.2 California Department of Parks and Recreation

Approximately 33,900 acres of the Truckhaven Geothermal Leasing Area are within the OWSVRA (see Figure 3-6), a CDPR system unit established in April 1976. It consists of over 80,000 acres (CDPR 2006) and receives over 600,000 vehicle visits a year (CDPR 2007). State Vehicular Recreation Areas are OHV parks operated by the Off-Highway Motor Vehicle Recreation Division of the CDPR on land owned by the California State Lands Commission.

The Ocotillo Wells area is divided into several access classifications: 85 percent is classified as Open-Use Zone, open to all types of OHV recreational uses; 15 percent is classified as Trail-Use Only, in areas located in the southwest and northeastern corners of the unit and specifically designated to minimize biological impacts to flora and fauna by keeping vehicles within established trailways; and 1 acre is classified as Closed Zone, at Barrel Springs (CDPR 1981). BLM parcels in the Truckhaven Geothermal Leasing Area limit OHV use to designated trails. Additionally, within the Truckhaven area there are several undesignated trails that OHVs frequently use.

Vehicle Types

The vehicle types utilized at the OWSVRA include off-road and street-legal vehicles, including sand rails, dune buggies, all-terrain vehicles, motorcycles, two- and four-wheel drive pickups, sport utility vehicles, and custom-built off-road vehicles.

OWSVRA General Plan

In 1971, the California Legislature passed the Chappie-Z'burg Off-Highway Vehicle Act. This act provided for the registration of vehicles, set equipment noise standards, and created OHV operating rules. Additionally, this law, combined with the Chappie-Gregorio Off-Highway Gas Tax Act, allows the CDPR to acquire land for the purpose of providing facilities to accommodate this form of recreation (CDPR 1981).

The following planning objectives of the OWSVRA General Plan guide the development and management of the OWSVRA:

- Establishment of land-use designations that protect resources and accommodate recreational activities;
- Establishment of interpretive programs that educate OHV users about desert safety and point out the need for user assistance in minimizing unit maintenance as well as preserving resources;
- Provision of increased OHV recreational opportunities through the interpretation of desert resources;

- Provision of facilities required for unit operation; and
- Provision of sewage storage and water supplies to handle increased visitation.

Current Situation

Recreation Visitation

The OWSVRA is located within a three-hour drive from Los Angeles, Orange County, Riverside, and San Diego, and a five-hour drive from Phoenix. The OWSVRA is a highly valued and unique recreation resource within the southwestern United States because: (1) it is an OHV area of an unparalleled size; and (2) it fills a unique and valued niche for providing motorized recreational opportunities in close proximity to the population centers of Southern California.

Continued population growth in Southern California, the expanding popularity of OHV recreation (a 108 percent increase in California since 1980), and a 48 percent decrease in the acres available to OHV recreation in the California Desert has resulted in a steady increase in visitation at the OHV areas in Imperial County, including the OWSVRA and the Imperial Sand Dunes Recreation Area (USDI BLM 2003a).

The area now within OWSVRA was first used for OHV recreation in the 1940s. OHV enthusiasts who visit the OWSVRA on holiday weekends experience large crowds, noise, and intensive 24-hour OHV activity, particularly near the base of Borrego Mountain, Squaw Peak, and the Mesquite Dunes area (USDI BLM 1981). There are locations within the OWSVRA where OHV recreation is less intense on holiday weekends, and visitors can have a quieter, less intensive experience. The OWSVRA is managed to provide motorized recreational opportunities to area residents and visitors. In addition to OHV recreation, the OWSVRA connects with ABDSP, which provides other recreational opportunities, including hiking, horseback riding, wildlife and scenery viewing, picnicking, photography, nature study, and environmental education, camping, sightseeing, and driving for pleasure. The OWSVRA provides wide-open spaces where visitors can seek either solitude or a highly intensified motorized recreational use experience.

Recreation Supply and Demand

The OWSVRA receives approximately 1.9 million visitors annually (2006 figures), with the heaviest visitation period occurring between Halloween and Easter, avoiding the hot summer months. Park management estimates that the area received approximately 633,000 vehicle trips to the OWSVRA during 2006 (Dolinar 2007).

Facilities

No fees are collected for camping or day-use. Open camping is permitted throughout the unit for up to 30 days per calendar year. Vault toilets, shade ramadas, picnic tables, and fire rings are located in the Quarry, Main Street, and Holmes Camp areas, which are located throughout the park (Dolinar 2006). Water is not available. A waste disposal

station is located on Ranger Station Road. Vehicle repair shops, fuel, telephones, groceries, a motel, and restaurants are available in the neighboring small town of Ocotillo Wells and along SR-78, where it borders the park (CDPR 2006).

Recreational Programs

Self-guided tours of the OWSVRA are available. The Ranger Station at the entrance to the OWSVRA offers limited programs, with the focus on responsible OHV use. Occasionally, the American Safety Institute offers a safety certification course for quad vehicles; however, there is no fixed schedule for when the course is offered.

Management Practices

A variety of practices can be used to manage recreation resources at the OWSVRA. The CDPR has a program that monitors natural, cultural, and recreational resources. State Parks also conducts visitor surveys, in cooperation with special interest groups, to inventory visitor satisfaction and needs. Using these inventories, State Park staff estimate how well they are meeting national, state, and local goals, and adjust actions accordingly.

Historical and Current Trends

California is the most populated state in the nation, with a population of 34 million in 2000, and is projected to have a population of 46 million in 2020. California also has the greatest number of OHV enthusiasts in the nation, with 3.5 million participants, comprising 14.2 percent of all households. Southern California has the majority of the OHV owners, while it has less opportunity than other parts of the state.

Between 1980 and 2001, OHVs in California increased by 108 percent (USDI BLM 2003a). Between 1994 and 2001, street licensed four-wheel drive vehicles increased by 74 percent. Between 1980 and 2000, acres available for OHV recreation decreased by 48 percent. OHVs today are more powerful, and have better suspension and traction than their predecessor models, which has led to faster and more reliable vehicles. OHV types have also diversified. It is not unusual to see standard dune buggies, long travel dune buggies, motorcycles, all-terrain vehicles, all-terrain cycles, golf carts, Odysseys, four-wheel drive vehicles, and custom vehicles using off-road recreation areas in California. Quad runners and all-terrain vehicles can cost upwards of $1,000, with larger and custom vehicles may cost $50,000 or more depending on the amount of customization. OHV enthusiasts are also using more technological equipment as part of their recreational experience.

3.16 Special Areas

3.16.1 Introduction

The BLM manages lands that possess unique and important historical, anthropological, ecological, biological, geological, and paleontological features. These features include undisturbed wilderness tracts, critical habitat, natural environments, open spaces, scenic landscapes, historic locations, cultural landmarks, and paleontologically rich regions.

Special Management Areas (SMAs) are administered with the intent to preserve, protect, and evaluate these significant components of our national heritage. Most SMAs are designated either by an Act of Congress or by Presidential Proclamation, or are created under BLM administrative procedures.

The National Landscape Conservation System (NLCS) is the primary management framework for these specially designated lands. BLM created the NLCS in June 2000 to bring some of the agency's premier areas into a single system. The NLCS designations include National Monuments, National Conservation Areas, Designated Wilderness Areas and Wilderness Study Areas, National Scenic and Historic Trails, and Wild, Scenic, and Recreational Rivers (USDI BLM 2005).

Other special areas managed by the BLM outside of the NLCS framework include Areas of Critical Environmental Concern (ACECs), Research Natural Areas, National Natural Landmarks, National Recreation Trails, and a variety of other area designations.

While the proposed action area contains no SMAs, there is an ACEC and a Wilderness Area within the greater vicinity. There are currently no other areas designated under the NLCS or other special areas managed by the BLM within the vicinity of the proposed action area.

3.16.2 Wilderness Areas

National Wilderness Areas, designated by Congress, are defined by the Wilderness Act of 1964 as places "where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." Designation is aimed at ensuring that these lands are preserved and protected in their natural condition. Wilderness Areas, which are generally 5,000 acres or more, offer outstanding opportunities for solitude or a primitive and unconfined type of recreation; such areas may also contain ecological, geological, or other features that have scientific, scenic, or historical value.

The Fish Creek Mountains Wilderness Area, designated by Congress as a Wilderness Area in 1994, is located approximately 7.5 miles south of the proposed action area (see Figure 1-3) and encompasses 21,425 acres of jagged ridges and peaks above twisting canyons and small valleys, with steep mountain slopes containing limestone outcrops. A portion of the ancient Lake Cahuilla shoreline is visible within this Wilderness Area.

3.16.3 Areas of Critical Environmental Concern

The BLM uses the ACEC designation to highlight public land areas where special management attention is necessary to protect and prevent irreparable damage to important historical, cultural, and scenic values; fish or wildlife resources; or other natural systems or processes.

The ACEC designation may also be used to protect human life and safety from natural hazards. The BLM identifies, evaluates, and designates ACECs through its resource management planning process. Allowable management practices and uses, mitigation, and use limitations, if any, are described in the planning document.

Two miles south of the southernmost portion of the Truckhaven Geothermal Leasing Area is the San Sebastian Marsh/San Felipe Creek ACEC. Within its 7,800 acres is habitat for endangered species, including desert pupfish. This ACEC also contains habitat for rare, threatened, and endangered species, including Bell's vireo (*Vireo bellii*), yellowbilled cuckoo (*Coccyzus americanus*), Southwestern willow flycatcher (*Empidonax traillii extimus*), black rail (*Laterallus jamaicensis*), and arroyo toad (*Bufo microscaphus californicus*). Because of continual habitat degradation of the endangered unarmored three-spined stickleback (*Gastereosteus aculeatus williamsoni*), it is no longer found in the San Sebastian Marsh/San Felipe Creek ACEC. However, to promote the survival of this species in the region, the BLM has placed an experimental population of this species upstream, along the San Felipe Creek, near Scissor's Crossing, in San Diego County.

This area receives special management attention under the San Sebastian Marsh/San Felipe Creek ACEC Management Plan (USDI BLM 1986). This plan identifies objectives to protect, maintain, and enhance habitat for these species and specifies planned actions to manage surface uses, physical and timing protections, predevelopment and development measures, and monitoring to achieve these objectives.

3.17 Social and Economic Conditions

3.17.1 Introduction/Regional Setting

Most of the economic and social effects of developing geothermal resources would occur in the irrigated valleys about 30 miles to the south and 30 miles to the north of the Truckhaven area. The Imperial Valley lies south of the Salton Sea and the Coachella Valley, in Riverside County, which lies just north of the Salton Sea (see Figure 1-3). Both valleys feature intensive irrigated agriculture, producing livestock and a variety of winter crops. They share an early historical development directly related to the construction of canals that bring Colorado River water to the valleys.

Despite their shared history, the valleys have evolved into communities that, in many respects, are quite dissimilar. Beyond agriculture, the major component of the Imperial Valley's economy is a sizable government sector, including the Naval Air Facility El Centro and two California State Prisons. It has recently begun to develop businesses related to transit of materials moving into the *maquiladoras* in Mexicali and goods moving into the U.S. Over the last 30 years, the population has grown at a rapid rate and has become increasingly Hispanic. Today, it is 72 percent Hispanic. Per capita personal income is among the lowest in California, and the County has had very high unemployment for decades.

On the other hand, the socioeconomic character of the Coachella Valley has been heavily influenced by the emergence of the valley's many resorts and second home and retirement communities since the Second World War. The area's warm winter weather and dry desert air have made it a popular tourist, recreation, and retirement destination. There are over 100 golf courses in the valley. Per capita incomes in communities such as

Palm Springs and Palm Desert are among the highest in the U.S. While the population has grown rapidly in the last several decades, unemployment has remained generally low.

The immediate vicinity of the Truckhaven area is in sparsely populated desert and foothill terrain. The population exists primarily in three small seaside communities: Salton City, Salton Sea Beach, and Desert Shores. Salton City lies immediately north of the proposed action area.

3.17.2 Current Conditions and Trends

Social Environment

The social environment of the project area is ethnically diverse, multicultural, and affected by the nearby border and urban interests. Although the project location is within Imperial County, with a population of approximately 160,000, the larger social environment includes the Imperial and Coachella Valleys that connect north to Riverside County and south to the Mexicali Valley and the U.S.-Mexico border. This larger social environment has a population of about 571,000. The majority of the population within Imperial County is Hispanic followed by whites, African-Americans, Asians, and Native Americans. As discussed in Section 3.9, there are notable Native American tribal lands and interests within the region, even though Native Americans represent a relatively small total of the population. The Mexican community of Mexicali south of El Centro has a population of nearly 900,000 and is a center of industry for Baja California. San Diego County to the west has a population of nearly 3 million who visit and recreate in the environs of the proposed project area. Similarly, to the north in Riverside County, Palm Springs is a population center that also supplies visitors and recreational users to the environs of proposed project area. This discussion highlights some of the characteristics of this social environment that can be identified using secondary source data. Such a characterization has limitations. The complexity of the social environment is suggested by secondary economic and demographic data, but the dynamics and specifics of lifestyles and beliefs require primary data collection. However, this overview is a starting point for assessing this social environment that can be supplemented as needed with primary data or additional secondary data.

Contemporary Imperial County occupies about 4,200 square miles in southeastern California. There are approximately 17 communities, including El Centro, the county seat and largest population center with more than 40,000 persons. Other noteworthy population centers include Brawley (~24,000), Calexico (~36,000), Imperial (~9,600), Calipatria (~7,900), and Holtville (~5,700). Smaller communities such as Westmorland (~2,450) and unincorporated communities such as Salton City, Desert Shores, Ocotillo, and Niland represent the smaller dispersed Imperial Valley communities. However, as noted, Mexicali to the south, San Diego to the west, Palm Springs to the north, and Yuma, Arizona, to the east represent larger urban population concentrations.

Lifestyles in this region are suggested by the communities' rural character, the region's agricultural history and economy, and the population's multicultural character. The county's history of agricultural development is reflected by the amount of farmland in production: the 2002 Census of Agriculture shows about 514,000 acres of agricultural

lands that produced products with a market value of about a billon dollars ($1,043,279,000), the ninth highest value in the United States. The presence of the international border contributes to the multicultural character of local communities, especially with the presence of the Mexican border community of Mexicali. However, Native Americans, Filipinos, and other ethnic groups have a noteworthy historical presence in this region. Cultural activities associated with ethnic identity as well as rodeos, cattle call parades, hunting, fishing, other outdoor activities contribute to a rural community lifestyle influenced by ethnic diversity.

The ample natural resources of this region, such as the Salton Sea, the Imperial Sand Dunes Recreation Area, the OWSVRA and a varied desert and mountain landscape, also attract visitors from nearby counties and states. The Imperial Sand Dunes Recreation Area and environs are recognized as one of the premiere OHV locations in this region. Similarly, the Salton Sea attracts birdwatchers as well as boating and fishing enthusiasts. The irrigation canals that bring water for the agricultural fields are also a recreational fishing resource for local residents as well as visitors. Such natural and human-made resources have resulted in non-local communities of interest that value the region's landscapes and recreational amenities.

The region's social environment is comprised of communities of place and communities of interest. The local communities of place are largely rural and have lifestyles and values based in the agricultural and multicultural character of the region. More distant urban communities such as San Diego are sources of recreational users and visitors who value the rural landscape of this region. The specifics of the region's demography and economy are detailed in the following section. These demographic and economic data offer a basis to assess the potential socioeconomic influences of the proposed geothermal development.

Demographics

As described above, the areas of most likely socioeconomic impact are the Imperial and Coachella Valleys. Table 3-8 identifies the population of these areas. For this analysis, demographic data for all Imperial County are used as representative of the Imperial Valley, as over 90 percent of the county population resides in the valley. For the Coachella Valley, however, demographic data were disaggregated from Riverside County data. The Coachella Valley makes up only a small part of Riverside County's population. Together, Imperial County and the Coachella Valley are referenced as the socioeconomic impact area. Riverside County and California data are included in the table for reference.

Both Imperial County and the Coachella Valley have seen rapid population growth in the last several decades. Since 1990, Imperial County has grown at a rate greater than California as a whole. The Coachella Valley has outpaced the State's growth rate and that of Imperial County. For the last quarter century, the population of the socioeconomic impact area has grown at a rate about three times faster than the State average.

Table 3-8 Population and Population Change

Area	Year			Percent Change	
	1990	2000	2005	1990–2000	2000–2005
Imperial County	109,303	142,361	161,621	30.2	13.5
Coachella Valley	230,865	318,475	409,240	37.9	28.5
Imperial County and Coachella Valley SIA	340,168	460,836	570,861	3.5	23.9
Riverside County	1,170,413	1,545,387	1,888,311	32.0	22.2
California	29,758,213	33,873,086	36,728,196	13.8	8.4
Principal Communities in Imperial County					
Brawley	18,923	22,052	24,014	16.5	8.9
Calexico	18,633	27,109	36,229	45.5	33.6
El Centro	31,405	38,025	40,982	21.1	7.8
Principal Communities in Coachella Valley					
Cathedral City	30,085	42,647	50,957	41.8	19.5
Indio	36,850	49,116	66,539	33.3	35.5
Palm Desert	23,252	41,155	49,595	77.0	20.5
Palm Springs	40,144	42,805	46,000	6.6	7.5
Projected Population Growth					
Area	**Year**			**Percent Change**	
	2010	**2020**	**2030**	**2010–2020**	**2020–2030**
Imperial County	178,201	214,386	254,989	20.3	18.9
Coachella Valley	456,279	574,618	693,861	25.9	20.8
Imperial County and Coachella Valley SIA Total	640,743	802,346	970,506	25.2	21.0
Riverside County	2,165,148	2,675,648	3,180,411	23.6	18.9
California	39,246,767	43,851,741	48,110,671	11.7	9.7

Source: USCB 2005.

Key: SIA = Socioeconomic Impact Area.

Also shown in Table 3-8 are the principal incorporated communities in the vicinity of the Truckhaven area. El Centro and Brawley have not experienced the explosive growth that Calexico has, and Calexico may soon be the most populous city in Imperial County. Calexico is in some respects part of the greater Mexicali metropolitan area. Mexicali, the capital of Baja California, lies across the international border from Calexico and has a population over 800,000.

The communities of the Coachella Valley, with the exception of Palm Springs, are growing rapidly. Palm Springs, at the western end of the valley, was the first community

to see resort development and has been largely built out. Cathedral City and Indio are in the southeastern part of the valley and are now experiencing new residential development.

Imperial County west of the Salton Sea, where the proposed action area is located, is sparsely populated. Its 2000 census count was 7,339 people. Three unincorporated communities are located on the western shore of the Salton Sea: Salton City, immediately north of the proposed leased tracts; Salton Sea Beach, north of Salton City; and Desert Shores, near the Riverside County line. These three communities have a combined population of 2,200 and, together with the population of Centinela State Prison (located in the same census tract; about 4,400 occupants), represent over 90 percent of the population of western Imperial County. The remaining 700 people are scattered throughout the area's 979 square miles, with less than one person per square mile.

The population of Imperial County described in the 2000 Census was 72.3 percent Hispanic, a percentage that has been increasing rapidly for decades. The Coachella Valley population was 46.4 percent Hispanic in 2000. In both areas, the Hispanic population is well above the 32.4 percent State average. The census indicated that Imperial County residents had a median age of 33.8 years, slightly higher than the State average, and that just over 10 percent had completed college. The median age of Coachella Valley residents was 37.3 years, above the State average of 33.3 years. Almost 20 percent had completed college, slightly above the State average.

Since the 1990s, the population growth rate in the socioeconomic impact area has been higher than the average growth rate of the State. This very high rate of growth is expected to continue into the foreseeable future. Table 3-8 identifies projected populations to the year 2030.

Employment and Income

Imperial County's economy is dominated by two sectors: agriculture and government. As Table 3-9 shows, the government sector's employment share is 24.9 percent in the County. This means that one in every four of those employed in Imperial County works for a Federal, State, or local government agency. The government sector tends to be larger than average in rural counties, but Imperial County's 25 percent is almost twice the California state average of 13.2 percent. Contributing to the size of the government sector are two state prisons – Centinela and Calipatria, and a major military installation – Naval Air Facility El Centro.

The largest private economic sector is agriculture. The farm sector, which includes direct farm employment, accounts for 8.3 percent of the total. The agriculture, forestry and fishing sector, which includes agricultural support and service employment, accounts for another 11.9 percent. Together, employment in the two agriculture sectors is 20.2 percent of the County's total employment. This is expected as the valley's irrigated agriculture was the historical basis for the area's original settlement. The Imperial Valley remains today one of the most important agricultural regions in the State and the nation. Its 514,000 acres produce cattle and sheep, livestock feed, and vegetables. Its 2002

Table 3-9 Employment by Industrial Sector

Sector	Imperial County		Coachella Valley		California
	Employ-ment	Sector Share (percent)	Employ-ment*	Sector Share (percent)	Sector Share (percent)
Total	**66,274**	**100.0**	**127,788**	**100**	**100**
Farm	5,491	8.3	2,000	1.6	1.5
Nonfarm	60,783	91.7	125,788	98.4	98.5
Private	44,280	66.8	109,873	86.0	85.3
Agriculture, forestry, fishing, related*	7,872	11.9	3,703	2.9	1.2
Mining*	500	0.8	10	0.0	0.2
Utilities	453	0.7	389	0.3	0.3
Construction	2,329	3.5	15,104	11.8	5.8
Manufacturing	2,518	3.8	2,903	2.3	8.1
Wholesale trade	2,022	3.1	2,190	1.7	3.7
Retail trade	8,482	12.8	17,591	13.8	10.3
Transportation, warehousing	2,194	3.3	1,966	1.5	2.8
Information	466	0.7	2,320	1.8	2.8
Finance and insurance	1,240	1.9	2,510	2.0	4.6
Real estate; rental; leasing	1,573	2.4	2,784	2.2	4.7
Professional, technical services	1,452	2.2	3,285	2.6	7.9
Management of companies	421	0.6	450	0.4	1.2
Administrative; waste services	1,881	2.8	8,094	6.3	6.4
Educational services	487	0.7	536	0.4	1.9
Health care; social assistance	3,433	5.2	12,470	9.8	8.4
Arts, entertainment, recreation	362	0.5	5,706	4.5	2.5
Accommodation, food services	3,075	4.6	23,744	18.6	6.6
Other services	3,520	5.3	4,118	3.2	6.0
Government	16,503	24.9	15,915	12.5	13.2
Federal, civilian	1,965	3.0	2,000	1.6	1.2
Military	541	0.8	N/A	N/A	1.2
State and local government	13,997	21.1	13,915	10.9	10.9
State government	2,855	4.3	37	0.0	2.4
Local government	11,142	16.8	13,878	10.9	8.5

Sources: USBEA 2004; CDC 2005.

Key: * = estimated; N/A = not applicable.

production was valued at just over one billion dollars, making it the eighth largest producing county in California and the ninth largest in the entire U.S. Economic sectors that are notably smaller than average in Imperial County are manufacturing and professional and technical services.

The economic structure of the Coachella Valley is quite different. Although the southeastern part of the valley, just north of the Salton Sea, has intensive agricultural production similar to the Imperial Valley's, the scale is much reduced. Coachella Valley's 70,000 acres in production represent not quite 15 percent of the Imperial Valley's. Coachella's agricultural sector is estimated to represent 4.5 percent of employment, far less than in Imperial County.

Economic sectors that predominate are accommodation, food services (18.6 percent), retail trade (13.8 percent), and construction (11.8 percent). Together these three sectors account for 44.2 percent of the Coachella Valley's employment. The size of these sectors reflects the number of resorts, recreation activities, and the ongoing construction of second homes and retirement communities in the northwestern part of the valley.

Unemployment in Imperial County has historically been very high, averaging around 16 percent between 2001 and 2005; in 1996, the rate reached 29.9 percent (EPS 2007). These levels are three and even four times the state average. Unemployment data for the Coachella Valley are not readily available, but rates for Riverside County tend to be similar to those of California as a whole.

Table 3-10 shows personal income in Imperial and Riverside Counties in 1995, 2000, and 2004. Imperial County has had historically low per capita personal income. As the table indicates, County per capita income is well below the average for the rest of the U.S. and ranks toward the bottom of California's 58 counties.

Income data for sub-County units such as the Coachella Valley are not readily available, so data for the entire county are listed in the table; however, it is well understood that per capita income in communities like Palm Springs and Palm Desert is very high and that, even moderated by lower incomes in the agricultural producing part of the valley, per capita income in Coachella Valley is well above the U.S. average.

Geothermal Development

Geothermal electrical production is part of the utilities sector, which has a relatively small share of Imperial County's total employment (see Table 3-9). The 16 geothermal power plants located in the County, together with subcontractors, may support around 600 jobs. However, the industry supplies utilities with an important regional source of electric power, generating over 500 MW of electricity. The industry is also an important revenue source to jurisdictions within Imperial County, representing about 10 percent of the County's property tax base. Although several geothermal greenhouse operations are located in the Coachella Valley, it has no geothermal power plants.

Table 3-10 Personal Income, Imperial and Riverside Counties

	1995	2000	2004
Imperial County			
Total personal income (000s)	$2,234,651	$2,530,315	$3,320,185
Per capita income	$16,313	$17,752	$21,794
Percent of U.S. per capita income	71	59	66
State rank	50	56	55
Riverside County			
Total personal income (000s)	$26,210,618	$37,014,951	$49,443,185
Per capita income	$19,090	$23,728	$26,448
Percent of U.S. per capita income	83	80	80
State rank	32	34	36
California			
Total personal income (000s)	$785,805,583	$1,103,841,912	$1,262,306,032
Per capita income	$24,161	$32,463	$35,219
Percent of U.S. per capita income	105	109	107

Source: USBEA 2004.

Recreation

Imperial County has some significant recreational features, notably the Salton Sea and the Imperial Sand Dunes Recreation Area. Offering boating, fishing, bird viewing, and camping, the Salton Sea had visitor use that was said to rival that of Yosemite until the mid-1980s. However, fish and bird die-offs, an increase in unpleasant odors, and concerns about pollution and water quality have produced a decline in recreational use in the last 20 years. The Imperial Sand Dunes Recreation Area is considered one of the premier sand dune OHV recreation areas in the United States. Estimated visitation during the 1999–2000 fiscal year was almost 900,000 people. Peaking during holiday seasons, this use produces seasonal spikes in local retail sales of groceries and fuel and in restaurant and lodging use.

The Truckhaven lease area is itself the site of another important OHV recreation area, the OWSVRA, which receives up to 1.9 million visitors a year – a number that is increasing annually. Comments received from individuals and OHV group representatives during scoping and on the Draft EIS for this project indicated that any potential closures to OHV recreation as part of the leasing program would have a detrimental impact on recreationists.

Public Revenue

The proposed action area is located in unincorporated Imperial County, and the County and jurisdictions within the County would be the principal recipients of revenues generated by geothermal development in the Truckhaven lease area. The geothermal industry is already an important revenue source for jurisdictions within Imperial County. The industry's 2005–2006 assessed valuation of $809 million represents 9.7 percent of the total County's assessed valuation of $8.3 billion. Estimated industry property taxes are $95.5 million (Buckner 2006). The County government is the largest public entity, with total 2003–2004 revenues of $193.6 million. Other local sources of public revenue are sales and use taxes, licenses, fees, and charges for services. Riverside County and the Coachella Valley are unlikely to receive measurable revenue from the project, although construction and operation of the plant may produce some sales tax receipts.

3.17.3 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations* (Federal Register 1994) requires Federal agencies to achieve environmental justice by identifying and addressing disproportionately high and adverse human health and environmental effects, including the interrelated socioeconomic effects of their programs, policies, and activities, on minority populations and low-income populations in the United States. Such impacts are to be avoided or minimized to the extent feasible.

Minorities are defined as individuals who are members of one or of the following population groups: Hispanic, African-American, American Indian or Alaskan Native, and Asian or Pacific Islander. *Minority populations* are those where the identified population in the affected area exceeds 50 percent or the minority population in the affected area is meaningfully greater than the minority population in the general population. *Low-income populations* are those that exceed the poverty threshold (CEQ 1997).

Table 3-11 identifies the ethnicity and racial components and poverty levels in places that could be affected by geothermal development of the proposed Truckhaven leases. Data are described for Riverside and Imperial Counties, and for regions within each county. As described above, Riverside County is quite large, and the portion of the County affected would likely be limited to the Coachella Valley. All of Imperial County may be affected, but the proposed action area lies just west of the Salton Sea; the part of the County west and southwest of the Salton Sea (identified as the Vicinity Impact Area in Table 3-11) is more likely to be directly affected.

Table 3-11 Race/Ethnicity and Poverty Level Truckhaven Area

Area	Race/Ethnicity, Percent of Population, 2000					Percent Below Poverty Level, 2003
	White	Hispanic	African-American	American Indian	Asian-Pacific	
Imperial County	20.2	72.3	3.8	1.3	1.9	19.8
Coachella Valley	47.8	46.4	2.0	1.9*	1.9*	10.0*
Vicinity Impact Area [a]	34.8	44.0	20.0	0.3	0.2	NA
Riverside County	51.3	36.4	6.1	0.7	3.9	12.3
California	47.1	32.6	6.5	0.6	11.3	13.8

Sources: CDF 2004; USCB 2005.
Key: * = estimated
Note:
[a] Census Tracts123.01 and 123.02.

As previously discussed, the population of Imperial County is heavily Hispanic, estimated at 72.3 percent in the 2000 Census. The population percentages of African-American and Asian Pacific communities are small relative to State averages. Although twice the State average, the percentage of American Indians is also small. Within the Coachella Valley, the Hispanic population makes up about 46 percent of the population, less than in Imperial County but above the State average. As in Imperial County, African-American and Asian-Pacific populations represent less of the population than the State average. American Indians are estimated to represent about 2 percent of the population.

As noted previously, Native Americans have a long inhabited the region. Contemporary tribal groups with a potential interest in the project area include the Torres Martinez Desert Cahuilla to the north of the proposed action area and at least 14 other tribes identified by the BLM. Some Southern California tribal entities have indicated initial interest in the proposed project. Specifically, a 2005 letter from the San Pasqual Band of Mission Indians indicates the potential for significant cultural effects because the Truckhaven tracts are perceived to be ancestral lands. Consultation between the BLM and tribal interests should indicate further cultural interests in the proposed project area. The potential exists for impacts to tribal entities based on cultural connections or interests in the project area.

The percent of the Imperial County population with personal incomes below the poverty level is higher than the State average, due to historically very low per capita income and the high unemployment rate in the County.

3.18 Transportation

This discussion addresses the existing vehicular traffic in and around the Truckhaven Geothermal Leasing Area. The scope of the analysis is limited to major public roads that provide access to the proposed action area.

3.18.1 Existing Access

Interstate 8 is the only freeway providing access in the vicinity of the Truckhaven Geothermal Leasing Area. Arterial branch SR-78 runs east to west south of the proposed action area. From the east, it turns generally north/south out of Westmorland and splits from SR-86 at the Border Patrol checkpoint (south of S-22) and continues west, south of the project area, in San Diego County. SR-86 continues north through the northeastern corner of the proposed action area and links with County Highway S-22(Borrego Salton Seaway) in Salton City before continuing north and eventually merges into the SR-111 Expressway, which links to Interstate 10. S-22 is an east-west County road providing access to the northern end of the proposed action area.

3.18.2 Existing Traffic Volumes

Table 3-12 shows 2005 traffic volumes on major access roadways in the vicinity of the Truckhaven area. The heaviest traveled segment of roadway is on SR-86 north of its intersection with SR-78. It has an average annual daily traffic volume of 12,100 vehicles and a peak-hour volume of 1,050 vehicles. The 2000 Highway Capacity Manual published by the Transportation Research Board establishes a system whereby highway facilities are rated for their ability to process traffic volumes. The terminology *level of service* (LOS) is used to provide a *qualitative* evaluation based on certain *quantitative* calculations, which are related to empirical values.

Table 3-12 2005 Traffic Volumes

Route	Segment	Peak Hour Volume	Annual Average Daily Traffic[a]	Level of Service
SR-78	Imperial County to Junction SR-86	180	900	D
SR-86	Junction SR-78 to Air Park Drive	1,050	10,400[b]	D
S-22	Junction SR-86 and San Diego County Line	Not applicable [c]	16,440[c]	C

Sources: Caltrans 2005; Imperial County 2003.

Notes:

[a] The average number of vehicles traveling on a route over a 24-hour period.

[b] Peak hour volume has not been calculated for this particular road segment.

Table 3-12 indicates that the LOS on SR-78 and SR-86 is D, based on the Highway Capacity Manual LOS chart for a two-lane highway on rolling terrain and assuming that no passing zones comprise 80 percent of the routes. LOS D is a zone that approaches unstable flow, with tolerable operating speeds; however, driving speed is considerably affected by changes in operating conditions. The LOS on S-22 is C, the minimum acceptable standard for Imperial County-maintained roadways. LOS C indicates operations where a significant number of vehicles are stopping with some backup and light congestion. S-22, a County-administered road, is subject to different operating criteria than SR-86 and SR-78, which are State-maintained highways.

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Chapter 4

Environmental Consequences

4.0 Introduction

This chapter analyzes the environmental consequences or impacts expected to occur as a result of implementing the proposed actions described for each alternative in Chapter 2. The scope of the impact analyses presented in this chapter is commensurate with the detail level of the actions presented in Chapter 2 and the availability and/or quality of data necessary to assess impacts. Current conditions in the proposed action area, as described in Chapter 3, were used as the baseline for assessing expected impacts.

4.0.1 Impact Analysis Methodology

The impact assessment that follows focuses on the general impacts that could occur as a result of implementing each of the alternatives. The methodology for this assessment conforms with the guidance found in following sections of the Council on Economic Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA): 40 CFR 1502.24 (Methodology and Scientific Accuracy); 40 CFR 1508.7 (Cumulative Impact); and 40 CFR 1508.8 (Effects).

The CEQ regulations require that agencies "rigorously explore and objectively evaluate" the impact of the alternatives. Given that the action alternatives in this Final EIS propose leasing of geothermal resources rather than project-level exploration, development and utilization of the resource, it is difficult to analyze specific, direct impacts in detail: there is no proposal before the BLM that specifies actual development. For this reason, the analysis relies on similar geothermal energy development projects to estimate surface disturbance and other impacts on the human environment.

Leasing in and of itself does not cause any direct impacts as defined by the CEQ regulations, which state that such effects "are caused by the action and occur at the same time and place" (40 CFR 1508.8(a)). It is reasonable, however, to foresee that on-the-ground impacts would occur if BLM leases the geothermal resources, but that the impacts of such activities would not occur until some point in the future. The impacts of leasing, therefore, would be indirect, which according to the CEQ regulations, "are caused by the action [leasing] and are later in time or farther removed in distance, but are reasonably foreseeable" (40 CFR 1508(b)). The following analysis addresses this class of impact. These impacts cannot be analyzed site-specifically, but they can be analyzed for the leasing area based on a reasonably foreseeable development (RFD) scenario.

Another type of indirect impact could occur from leasing the Federal mineral estate. For example, BLM leasing at Truckhaven may cause developers (lessees) to acquire surface use and mineral rights to other adjacent non-BLM lands for economic and technical reasons. Under the RFD scenario, it is assumed development would occur on non-BLM

land, as well as BLM managed lands. The trigger for the impacts on these non-Federal lands can be reasonably linked to the leasing of BLM land. Indirect impacts to non-BLM land from activities occurring on BLM lands may include noise, water quality, visual impacts, loss of habitat, and displacement of existing uses such as recreation.

4.0.2 Terminology Used

Terms referring to the intensity, scope (geographic extent), and duration of impacts are used in this chapter. Impacts are not necessarily negative; some are positive benefits and are identified as such. The following terminology is used in the impacts analysis:

- Adverse: The effect is negative to a particular resource or a number of resources.
- Beneficial: The effect is positive to a particular resource or a number of resources.
- Negligible: The effect is at the lower level of detection; change would be difficult 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 at a specific site or within a known boundary.
- Short-term: The effect occurs only for a short time after implementation of a management action. For example, construction of an exploration well would remove vegetation from the area. After the well is drilled and exploration is completed, the area would be reclaimed with native vegetation. Given the region's lengthy growing season, the area would be revegetated within a year. Noise impacts from drilling rigs would also be considered short-term.
- Long-term: The effect occurs for an extended period after implementation of a management action. Loss of vegetation from construction of well pads, roads, and other facilities would be considered a long-term impact. Also, power plant noise would be a long-term impact, as it would last as long as it is in operation.

4.0.3 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. Impact analyses based on incomplete or unavailable information are identified in this chapter where applicable.

4.0.4 Mitigation

Mitigation measures designed to reduce or avoid impacts are included in this document as best management practices (BMPs) and are the same for both action alternatives. Sections 2.1.5 and 2.1.6 list potential mitigation measures. During subsequent authorizations, specific mitigation measures may be developed as conditions of approval.

4.0.5 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:

- Operation of the Truckhaven field and power plants would last up to 90 years;
- Exploration would last 6 to 18 months;
- Drilling would last 60 days per well; and
- Power plant construction would take 4 months.

4.0.6 Chapter Format

The impact assessment in this chapter discusses the impacts to elements of the human environment from future activities if the lands are leased. Each resource impact assessment section is divided into four subsections:

- Management goals from approved land-use plans or other policy directives;
- Impact criteria relating to key considerations in the impact analysis;
- General impacts typical from geothermal energy development activities; and
- Impacts by alternative.

In accordance with the CEQ regulations and BLM's NEPA handbook (H-1790-1), Chapter 4 concludes with the following sections:

- Cumulative Impacts (Section 4.19);
- Irretrievable and Irreversible Impacts (Section 4.20);
- Short Term Use versus Long-Term Productivity of the Environment (Section 4.21); and
- Residual Impacts (Section 4.22).

4.1 Air Quality

4.1.1 Management Goals

The California Desert Conservation Area (CDCA) Plan provides the following management direction for air quality protection in the region:

- Areas will be managed to protect their air quality and visibility in accordance with Class II objectives of Part C of the Clean Air Act Amendments, unless otherwise designated another class by the State of California as a result of recommendations developed by any BLM air quality management plan.

4.1.2 Impact Criteria

The potential risk of indirect impacts on air quality is assessed with respect to three criteria. Potential impacts on air quality could occur if any of the following were to take place:

- Reasonably foreseeable future actions conflict with or obstruct implementation of the applicable air quality attainment plan;

- Reasonably foreseeable future actions violate any stationary source air quality standard or contribute to an existing or projected air quality violation; or

- Reasonably foreseeable future actions expose sensitive receptors (e.g., concentrations of children, the elderly, or persons with respiratory conditions) to major pollutant concentrations.

The analysis of indirect air quality impacts from exploration, development, production, or closeout uses a high-to-low scale of risks. The following definitions are used in assessing the potential risk of future indirect impacts from geothermal exploration and development:

- High: The risk of potential indirect impacts would be high if significant impacts to the above criteria occurred during exploration, development, production, or closeout;

- Medium: The risk of potential indirect impacts would be medium if moderate impacts to the above criteria occurred during exploration, development, production, or closeout; and

- Low: The risk of potential indirect impacts would be low if minor or no impacts to the above criteria occurred during exploration, development, production, or closeout.

4.1.3 Typical Impacts from Geothermal Development

Clean Air Act Conformity

The General Conformity Rule is a statutory obligation under Section 176(c)(4) of the 1990 Clean Air Act Amendments as set forth by Congress. Section 176 authorizes the U.S. Environmental Protection Agency (EPA) and the states to regulate Federal activities to a greater extent than they regulate private activities. All private, State, and Federal activities must comply with specific State Implementation Plan requirements and obtain pre-construction permits, if applicable. Pursuant to Section 176, only Federal agencies are required, as an additional matter, to determine, prior to taking that action, whether such action will conform to the State Implementation Plan.

Under the General Conformity Rule, conformity determinations are made on a case-by-case basis. However, in an effort to limit time and resources invested by agencies in making determinations for thousands of Federal actions annually, the EPA included the *de minimis* levels in the rule to serve as cutoff points to focus on those Federal actions likely to have the most significant impacts on air quality. Table 4-1 presents *de minimis* levels for exemption from general conformity.

Table 4-1 *De Minimis* Levels for Exemption from General Conformity

Pollutant	Tons per Year
O_3 (VOCs or NO_x)	
Serious non-attainment areas	50
Severe non-attainment areas	25
Extreme non-attainment areas	10
Marginal and moderate O_3 non-attainment and ozone maintenance areas outside an O_3 transport region	
VOCs	100
NO_X	100
Marginal and moderate non-attainment and ozone maintenance areas inside an O_3 transport region	
VOCs	50
NO_X	100
Carbon monoxide	
All non-attainment and maintenance areas	100
Sulfur dioxide or nitrogen dioxide	
All non-attainment and maintenance areas	100
PM_{10}	
Moderate non-attainment and maintenance areas	100
Serious non-attainment areas	70
Lead	
All non-attainment and maintenance areas	25

Source: 40 CFR 51.

Key: O_3 = ozone; VOCs = volatile organic compounds; NO_x = nitrogen oxides; PM_{10} = particulate matter less than 10 microns in diameter.

The current conformity rule only applies to nonattainment and maintenance areas. Temporary emissions are not exempt from general conformity.

If an action is in a nonattainment area and the total emissions are below *de minimis* levels, a determination of whether the project is regionally significant is still needed. If it is not regionally significant, then the conformity requirements do not apply to this project based on its projected emissions. Regional significance is determined by calculating 10 percent of a total nonattainment or maintenance area's emission inventory for the specific pollutant. In determining regional significance, emissions from both stationary and mobile source emissions should be calculated.

Construction actions that generally require a conformity review include:

- Construction or modification of any air emission source not covered under a New Source Review or Prevention of Significant Deterioration permit or a hazardous waste remediation action; or

- Construction, renovation, or demolition of buildings or facilities.

Since the Truckhaven area is located in an area designated as nonattainment for both ozone and particulate matter less than 10 microns in diameter (PM_{10}), a conformity review would be required for nitrogen oxides (NO_x), volatile organic compounds (VOCs), and PM_{10} at the implementation stage of the process.

Criteria and Other Pollutants

The visible plumes seen rising from some geothermal power plants are water vapor emissions (steam) from flash or stream-type power plants. The RFD scenario estimates that up to two binary power plants could be operating in the Truckhaven area; therefore, visible steam plumes would be negligible. Because geothermal power plants do not burn fuel like fossil fuel plants, they release virtually no air emissions.

The following pollutants are associated with geothermal power plants:

- **Hydrogen Sulfide (H_2S).** H_2S remains the pollutant generally considered to be of greatest concern for the geothermal community. The binary geothermal power plants envisioned by the RFD scenario would not emit H_2S and would, therefore, not affect air quality.

- **Nitrogen Oxides (NO_X).** Because geothermal power plants do not burn fossil fuel, they do not emit NO_X from energy production. Diesel fumes from drill rigs and trucks, however, do emit NO_X during drilling operations. In some cases where H_2S is present and combusted, negligible amounts of NO_X are

produced. It is expected that the geothermal resource at Truckhaven has negligible amounts of H_2S, which would lead to negligible releases of NO_X.

- **Sulfur Dioxide (SO_2).** SO_2 forms when fuel containing sulfur is burned at power plants. While geothermal plants do not emit SO_2 directly, once H_2S is released as a gas into the atmosphere, it spreads into the air and eventually changes into SO_2 and sulfuric acid. Therefore, any SO_2 emissions associated with geothermal energy would be derived from minor amounts of H_2S emissions. Because H_2S would not be emitted from the expected binary plants, sulfur oxide impacts to air quality would be negligible.

- **PM_{10} and $PM_{2.5}$.** PM_{10} and $PM_{2.5}$ are emitted through the full process of fossil fuel electricity production, particularly coal mining. Although coal and oil plants produce large amounts of PM_{10} and $PM_{2.5}$, geothermal plants emit almost none. Water-cooled geothermal plants do emit small amounts of PM_{10} and $PM_{2.5}$ from the cooling tower when steam condensate evaporates as part of the cooling cycle; however, as air-cooled fans are considered in the RFD scenario, PM_{10} and $PM_{2.5}$ impacts would be negligible.

- **Carbon Dioxide (CO_2).** A colorless, odorless gas, CO_2 is released into the atmosphere as a byproduct of burning fuel. Geothermal plants do emit CO_2, but in small quantities compared to fossil fuel-fired emissions. Some geothermal reservoir fluids contain varying amounts of certain noncondensable gases, including CO_2. Geothermal steam is generally condensed after passing through the turbine. However, air-cooled towers are considered in the RFD scenario; therefore, CO_2 would not be released into the atmosphere. The amount of CO_2 found in geothermal fluid can vary depending on location, and the amount of CO_2 actually released into the atmosphere can vary depending on plant design. Binary plants with air cooling are in a closed loop system and emit no CO_2 because, in this system, geothermal fluids are never exposed to the atmosphere.

- **Mercury.** Mercury occurs naturally in soils, groundwater, and streams, but human activity can release additional mercury into the air, water, and soil. Mercury is not present in every geothermal resource; however, if mercury is present in a geothermal resource, using that resource for power production could result in mercury emissions, depending on the technology used. Because binary plants pass geothermal fluid through a heat exchanger and then return all of it to the reservoir, they would not emit any mercury.

- **Volatile Organic Compounds (VOCs)**. Geothermal power plants may emit small amounts of naturally occurring hydrocarbons, such as methane. Methane is the primary organic compound emitted by geothermal plants, followed by ethane and propane. The EPA's inventory of methane emission from electric plants does not list geothermal, confirming that methane emissions from geothermal are generally insignificant. Methane emission

estimates are uncertain, however, because they are usually accidental or incidental to biological processes, and they are not always present in geothermal systems.

- **Other reactive organic gases**, such as benzene, a known carcinogen, could be released into the atmosphere from flash power plants. It is expected, however, that development at Truckhaven would be a binary power plant.

- **Ammonia.** Naturally occurring ammonia is emitted at low levels by geothermal facilities. While livestock is responsible for almost half of ammonia emissions in the U.S., geothermal energy production accounts for only a fraction of ammonia emissions – substantially less than 1 percent; therefore, the impacts to air quality are negligible.

Geothermal plants emit only trace amounts of NO_x, almost no SO_2, and small amounts of CO_2. The primary pollutant that a minority of geothermal plants must abate is H_2S, which is naturally present in many volcanic geothermal reservoirs. With the use of advanced abatement equipment, however, emissions of H_2S are regularly maintained below California standards.

Fuel combustion does not occur in the production of electricity at a geothermal facility. Air-cooled systems emit no water vapor; thus, they blend easily into the environment. Although not considered in the RFD scenario, in a water cooling process, 50 percent or more of the geothermal fluid that enters the cooling tower is emitted to the atmosphere as water vapor, while the remainder recycles back into the reservoir. Geothermal water vapor emissions contain only trace amounts of the pollutants typically found in much greater quantities in coal and gas power plant emissions.

4.1.4 Air Emission Estimates

The EPA has determined specific Federal actions, or portions thereof, to be exempt from a formal conformity determination. Actions are exempt where the total net increase of all reasonably foreseeable direct and indirect emissions (1) would be less than specified emission rate thresholds, known as *de minimis* limits, and (2) would be less than 10 percent of the area's annual emission budget. Therefore, total annual emissions resulting from project construction would be calculated to determine whether the project is exempt and therefore would have no impacts.

Emissions have been calculated using emission rates and assumptions from Air Quality Thresholds of Significance (SMAQMD 1994), the CEQA Air Quality Handbook, (SMAQMD 1993), and Compilation of Air Pollutant Emission Factors (EPA AP-42). Appendix E contains a detailed description of the emission assumptions and calculations. Estimates for building area and total disturbed area were based on data provided in Chapter 2 and Appendix B of this document.

Well drilling and construction activities for the RFD are expected to take place over 27 months or within a 3-year period. Fugitive emissions would result from well drilling

and construction activities such as site preparation, new buildings, and vehicle traffic. There would be combustion emissions from drilling rigs, construction equipment, and personally owned vehicles (POVs).

Emission Estimates for Year 1

During Year 1 of the RFD, three wells would be drilled to a depth of 5,000 feet over a six-month period. Emissions from road and pipeline construction and POVs are also estimated. Appendix E provides a detailed breakdown and assumptions related to the assessment of air emissions from the construction of these facilities. Table 4-2 summarizes emissions estimates during Year 1.

Table 4-2 Year 1 Emissions Estimates in Tons

Activity	VOCs	NO_X	SO_2	CO	PM_{10}
Well drilling – fugitive dust	---	---	---	---	0.0020
Well drilling – combustion equipment	1.78	10.53	1.66	14.58	0.28
Construction	0.86	10.70	0.71	2.32	7.60
Personally owned vehicles	0.014	0.023	---	0.13	0.0023
Total Emissions from Construction	**2.66**	**21.25**	**2.37**	**17.03**	**7.89**

Emission Estimates for Year 2

During Year 2 of the RFD, eight additional wells would be drilled to a depth of 5,000 feet, and construction of one 25-megawatt (MW) geothermal power plant would commence. Construction of the power plant is expected to take a total of four months to complete with two months of construction occurring in Year 2. An estimate of 64.3 acres being disturbed was used to determine the emissions estimate. POV emissions are also estimated. Appendix E provides a detailed breakdown and assumptions related to the assessment of air emissions from the construction of these facilities. Table 4-3 summarizes emissions estimates for Year 2.

Table 4-3 Year 2 Emission Estimates in Tons

Activity	VOCs	NO_X	SO_2	CO	PM_{10}
Well drilling – fugitive dust	---	---	---	---	0.0039
Well drilling – combustion equipment	3.56	21.06	3.32	29.16	0.57
Construction	0.97	12.06	0.80	2.61	20.17
Personally owned vehicles	0.23	0.27	---	2.56	0.011
Total Emissions from Construction	**4.77**	**33.38**	**4.12**	**34.33**	**20.75**

Emission Estimates for Year 3

During the first two months of Year 3, two additional wells would be drilled, construction of the power plant would be completed, and there will be POV emissions. The emissions

estimate assumes that 13.6 acres would be disturbed. Appendix E provides a detailed breakdown and assumptions related to the assessment of air emissions from the construction of these facilities. Table 4-4 summarizes emissions totals for Year 3.

Table 4-4 Year 3 Emission Estimates in Tons

Activity	VOCs	NO_X	SO_2	CO	PM_{10}
Well drilling – fugitive	---	---	---	---	0.0013
Well drilling – combustion equipment	1.19	7.02	1.11	9.72	0.19
Construction	0.21	2.55	0.17	0.55	5.38
Personally owned vehicles	0.075	0.084	---	0.85	0.0026
Total Emissions from Construction	**1.47**	**9.65**	**1.28**	**11.12**	**5.57**

Total annual emissions resulting from project construction within each year of activity have been estimated. Annual PM_{10} emissions are estimated to increase 7.89 tons in Year 1, 20.75 tons in Year 2, and 5.57 tons in Year 3 of construction. Annual VOC emissions are estimated to increase 2.66 tons in Year 1, 4.77 tons in Year 2, and 1.47 tons in Year 3 of construction. Annual NO_X emissions are estimated to increase 21.25 tons in Year 1, 33.38 tons in Year 2, and 9.65 tons in Year 3 of construction.

Emissions Estimate for Operations

Once construction is completed and the power plant is operational, there would be POV emissions from worker and delivery vehicles. Appendix E provides a detailed breakdown and assumptions related to the assessment of air emissions from POVs, and Table 4-5 summarizes these emissions. Emissions from the plant itself will be accounted for in the construction/operating permit application that would be reviewed by the Imperial County Air Pollution Control District.

Table 4-5 Operations Emission Estimates in Tons

Activity	VOCs	NO_X	CO	PM_{10}
Personally owned vehicles	0.10	0.11	1.16	0.0017
Total Emissions from Construction	**0.10**	**0.11**	**1.16**	**0.0017**

Conformity Review Determination

Since no calendar year would see annual emissions of PM_{10}, SO_2, or NO_X exceed the 100 tons per year *de minimis* threshold, the project would be exempt from the General Conformity Rule and would not require a conformity review.

4.1.5 Impacts by Alternative

Alternative 1

Under the No Action Alternative, no lands would be leased in the Truckhaven Geothermal Leasing Area. As a result, no additional air emissions would be generated by the geothermal processes, but the energy needs would be filled by fossil fuel-generating facilities, resulting in overall increased air emissions and a negative impact to air quality to the respective power plant facility areas in California and the western U.S.

There would be no land disturbance to generate particulate matter, nor emissions from construction equipment exhausts. There would be no additional air quality impacts as a result of well drilling or operational activities.

Compared to Alternatives 2 and 3, the No Action Alternative provides the least amount of impact to air quality during activities associated with exploration, construction and operation.

Alternative 2

Under Alternative 2, 17 percent of the lands in the Truckhaven Geothermal Leasing Area would be leased for geothermal energy development. Up to two geothermal power facilities would generate air emissions but could replace up to 50 MW of energy supplied by fossil fuel power facilities. Consequently, there would be an overall benefit to air quality as a result of the geothermal development compared to Alternative 1.

Some particulates would be generated as a result of land disturbance activities. Particulates also would be generated from the use of the unpaved access road. See Tables 4-2, 4-3, 4-4 and 4-5 for estimated particulate emissions from all activities.

Since this alternative would provide for geothermal development, it would also involve well drilling activities. Impacts from well drilling activities would result from exhaust emissions from construction equipment and particulate emissions as a result of soil disturbance. Particulate emissions would also be generated from use of the unpaved access roads. These indirect impacts would be localized and short-term within small portions of BLM sections, but they would be mitigated through BMPs and dust suppression methods.

Diesel engine exhaust, well testing, and dust would be the primary impacts to air quality from well drilling. Steam vented during a well test can contain significant amounts of dust, H_2S, and other non-condensable gases. H_2S emissions would be abated through the injection of hydrogen peroxide and sodium hydroxide into the test line; therefore, emissions would be negligible. Indirect impacts of dust emissions from well testing would be reduced by injecting water into the test line. Dust emissions from roads would be mitigated by periodic watering.

Because the binary cycle is a closed loop process, geothermal fluid is never exposed to the atmosphere, and there would be no significant sources of air pollution. Indirect impacts of Alternative 2 would be similar to Alternative 3 and greater than Alternative 1.

Alternative 3

Under Alternative 3, all lands in the Truckhaven Geothermal Leasing Area would be leased for development. The geothermal power facilities would generate the same amount of air emissions from up to two binary power plants and the same number of wells proposed in the RFD scenario; however, these would be potentially spaced over twice as many BLM sections.

More particulates could be generated from land disturbance activities, such as activity on unpaved roads and trails, because of the greater distances to be traversed compared to Alternative 2. Dust emissions from roads would be reduced by periodic watering.

Because the binary cycle is a closed loop process, geothermal fluid is never exposed to the atmosphere, and there would be no significant sources of air pollution. Indirect impacts of Alternative 3 would be similar to Alternative 2 because the amount of land disturbance would be the same (long-term use of 405 acres of land for wells, roads, and power plants) to generate up to 50 MW (net); however, both would be greater than Alternative 1.

4.2 Noise

4.2.1 Management Goals

The CDCA Plan does not have any formal management goals for noise. However, the CDCA Plan's Motorized Vehicle Access Element states:

- Based on implementation priorities, BLM will, with assistance from the public, determine which routes in [multiple use] Class L and M areas need to be closed or limited in some other way. Route approval will be based on these considerations (from 43 CFR 8342.1 (1981)).

- Areas and trails shall be located to minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands, and to ensure the compatibility of such uses with existing conditions in populated areas, taking into account noise and other factors.

4.2.2 Impact Criteria

An action could have a significant noise effect if it would generate new sources of substantial noise, increase the intensity or duration of noise levels to sensitive receptors, or result in exposure of more people to high noise levels.

4.2.3 General Impacts

Geothermal exploration and development would generate noise but would not expose noise-sensitive land uses to new noise sources. Noise impacts would be associated with the use of construction equipment during exploration and development and subsequent operation of geothermal facilities. The principal noise sources during construction would be construction equipment. New noise sources during operations would be vehicles that would access the geothermal well sites and power plants. These noise sources would be an intensification of use on land primarily used for off-highway vehicle (OHV) recreational use.

Construction Activities

Construction equipment noise levels vary widely with the equipment used and activity level or duty cycle. In a typical construction project, the loudest short-term noise levels last for a few minutes during each cycle. They occur during site preparation and grading from earth-moving equipment under full load (on the order of 90 dBA at a distance of 50 feet from the source). Construction equipment noise is usually considered to be a point source, with attenuation within short distances at a rate of 6 dBA per doubling of distance (e.g., a noise level of 90 dBA at 50 feet will be 84 dBA at 100 feet, 78 dBA at 200 feet, and 72 dBA at 390 feet). The nature of construction projects, with equipment moving from one point to another, work breaks, and idle time, is such that long-term noise averages are less than short-term noise levels. For analysis of the proposed action, a maximum 1-hour average noise level of 80 dBA at a distance of 50 feet from the construction area is assumed for the site preparation phase.

Well Pad Construction

Construction of the proposed facilities would require heavy equipment operations for grading, filling, compacting, and paving. Construction would also require heavy equipment and trucks to access the BLM parcels under development. However, heavy vehicles generate noise levels much lower than those generated by OHV use. After site preparation, noise would be generated by other diesel engine- and gas engine-driven well-boring equipment and by normal construction activities such as the use of power saws, drills, and hammers. Based on the projected construction activities, noise levels would average 60 to 70 dBA L_{eq} at a distance of 50 feet.

The maximum noise level generated by construction noise sources is expected to be 85 dBA at a distance of 50 feet. The maximum noise level from normal power plant operations may also be 85 dBA, but at a distance of only 3 feet. Thus, at a distance of 0.5 miles, construction noise of 85 dBA at 50 feet would be reduced to about 50 dBA (equivalent to rural to suburban residential areas during daytime), and power plant operation noise of 85 dBA at 3 feet would be reduced to only 26 dBA (substantially less than a whispered conversation at 6 feet or a quiet library). Construction noise would be expected to meet the ambient 65 dBA level at a distance of about 500 feet. Well pad construction is estimated to take approximately one week per pad site.

Well Drilling and Testing

Noise would be generated from drilling and testing operations at each well pad. Drilling noise would be both continuous and intermittent noise. Operations are estimated to last approximately 6 weeks for drilling and one day for flow testing. Noise levels are estimated at approximately 65 dBA at 500 feet (U.S. Navy 1997). Table 4-6 presents noise levels from geothermal development activities taken from a similar geothermal project.

Table 4-6 Noise from Geothermal Development Activities

	Noise Level (dBA)					
	100'*	**200'**	**500'**	**1000'**	**2000'**	**5,000'**
Site preparation and construction	78	73	66	58	50	38
Well drilling	75	68	60	53	44	30
Flow testing	78	73	66	59	52	42

Source: U.S. Navy 1997.

* Distance from noise source.

Operational Activities

Well operations and energy generation would also contribute to increased noise levels. The principal noise sources would be turbine operations and noise generated from cooling tower, with additional noise coming from vehicles going to and from the existing and proposed facilities.

Activities at the proposed well sites and generation plants would be substantially different from existing activities (namely OHV recreation). However, noise levels in the surrounding areas from operational activities would be at ambient levels less than 0.5 miles from the facility footprints. Future noise generated from the proposed geothermal wells and power plant would be expected to remain essentially the same over time.

Of the potential new facilities, it is estimated the 50-MW (net) power generation plants would generate the greatest noise levels due to the operation of a cooling towers, which would generate a low-level humming sound. To the greatest extent possible, the power plants would be sited using terrain to further shield for noise impacts. At a distance of 0.5 miles, power plant operation would generate noise levels of approximately 26 dBA.

This modeled noise prediction of 26 dBA at 0.5 miles does not take into account the presence of topographic features, such as intervening hills. Because the potential power plants would be sited in terrain designed to reduce noise and visual impacts to the greatest extent possible, noise levels could be further reduced. Thus, the actual noise levels would not increase nighttime or daytime ambient noise levels or be audible to nearby sensitive resources.

Sensitive Receptors

The nearest sensitive human receptors to proposed geothermal well construction and power plant sites are single-family residences located north of the Truckhaven Geothermal Leasing Area in Salton City. Although operational noise levels would be louder than current conditions, the resultant noise levels at these residences would be below the daytime ambient noise level. With the distances involved between geothermal well development sites and sensitive receptors, construction noise would not be an adverse impact.

4.2.4 Impacts by Alternative

Alternative 1

Under the No Action Alternative, there would be no BLM parcels leased for geothermal development, and no geothermal wells, pipelines, or power plant facilities would be developed. There would be no noise impacts.

Alternative 2

Alternative 2 would result in no significant changes to the existing noise environment. Although there would be increased noise activity in the parcels under lease application, noise impacts from construction would be short-term. Operational noise would occur at approximately ambient levels within the Ocotillo Wells State Vehicular Recreation Area (OWSVRA). No sensitive resources would be impacted, and there would be no adverse noise impacts.

Alternative 3

Alternative 3 would result in no significant changes to the existing noise environment. Although there would be increased noise activity in the parcels under lease applications, noise impacts from construction would be short-term. Operational noise would increase noise levels within the OWSVRA, but it would not produce significant increases in noise levels to the nearest residences to the project. No sensitive resources would be impacted, and there would be no adverse noise impacts.

4.3 Topography, Geology, and Geologic Hazards

4.3.1 Management Goals

The CDCA Plan goals for geology and minerals resources are as follows (see also Section 4.14, Energy and Minerals):

- Within the multiple-use management framework, assure the availability of known mineral resource lands for exploration and development.

- Encourage the development of mineral resources in a manner which satisfies national and local needs and provides for economically and environmentally sound exploration, extraction, and reclamation processes.

- Develop a mineral resource inventory, geology-energy-minerals database, and professional, technical, and managerial staff knowledgeable in mineral exploration and development.

4.3.2 Impact Criteria

The potential risk of these indirect impacts affecting topography, geology, and geologic hazards is assessed with respect to three criteria. Potential impacts on these resources could occur if these reasonably foreseeable future actions:

- Were located on or near the trace of a known active fault or an area characterized by surface rupture that might be related to a fault;

- Were to increase the potential for human injury or economic loss from earthquakes, liquefaction, slope failure, or other geologic hazards; or

- Were to damage or degrade an important geologic feature or landmark.

The potential risk of indirect impacts affecting geology from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of indirect impacts from the proposed action:

- High: If there were significant impacts on the above criteria;
- Medium: If there were moderate impacts on the above criteria; and
- Low: If there were minor or no impacts on the above criteria.

4.3.3 General Impacts

Since the proposed action area is already relatively flat, moderate grading would have no adverse impacts to topography. No significant soil or unique geologic conditions were observed or are known to exist that would preclude the proposed geothermal exploration and development. As stated in Section 2.2, Reasonably Foreseeable Development Scenario, 50 wells (25 production and 25 injection) would be drilled. Each well would be between 3,000 and 6,000 feet deep. Each well would require a well pad of approximately 2 acres, including minor cut and fill, and would require 1 mile of 30-foot wide access road and 1 mile of pipeline, which would add an additional 10 feet in width to the access road. Two binary power plants would be constructed, and each would require about 17 acres, including cut and fill. Each plant would require 1 mile of access road and 5 miles of new transmission line.

Initially under both action alternatives, 502 acres of land (BLM and non-BLM) would be disturbed throughout the Truckhaven area from geothermal activities. After completion

of the field, some of the land would be reclaimed, and the final surface disturbance would be 405 acres of land (BLM and non-BLM). This would be less than 1 percent of the total Truckhaven area. The risk associated with these impacts would be low.

Geothermal exploration, drilling, and development would be subject to stormwater measures contained in a Stormwater Pollution Prevention Plan (SWPPP) and would include other BMPs as required by the General Construction Activity Stormwater Permit issued by the California State Water Resources Control Board. The SWPPP would be subject to the review and approval of the Regional Water Quality Control Board. Due to the lack of rain in the area, the risk associated with erosion would be low.

Faulting and Seismicity

Potential geologic hazards associated with earthquakes include ground shaking, ground rupture, landslides, liquefaction, and tsunamis and seiches. Based on the Alquist-Priolo maps, recent fault rupture has not been mapped on BLM-administered land within the Truckhaven Geothermal Leasing Area. The closest recent fault rupture mapped is about 4 miles from the southeast and southwest corners of the proposed action area (CDC 1974a, 1974b). However substantial shaking due to earthquakes may be expected in this seismically active area. Ground shaking is the earthquake effect that results in the vast majority of damage to human-made structures. A selected spot in the middle of the Truckhaven Geothermal Leasing Area could have a peak ground acceleration of approximately 0.46 times that of gravity in alluvial fill (CDC 2006). Ground motions (10 percent probability of being exceeded in 50 years) are expressed as a fraction of the acceleration due to gravity. Geothermal power plant structures would need to be designed to withstand these ground motions. Since standard construction design measures would be implemented in all geothermal infrastructure, the risk associated with these impacts would be low.

Induced seismic activity from geothermal development is theoretically possible (National Park Service 2003). The literature indicates that small, imperceptible earthquakes (2 to 3 on the Richter scale) are possible as a result of reinjection of fluids into the earth. There is a greater concern for larger earthquakes in areas where enhanced geothermal systems (EGS) are being tested. In these areas, dry (hot) rock is injected with liquid to create geothermal fluids that may then lubricate faults which may slip and cause an earthquake. It should be noted, however, that EGS is not anticipated at Truckhaven.

Landslides

Most of the topography in the area is very gentle; thus landslides would not be expected. There could be small slides on the sides of incised washes, such as Tule Wash, or on some of the larger hills.

Liquefaction

Liquefaction is the phenomenon in which saturated fine-grained sediments temporarily lose their shear strength during periods of ground shaking. Groundwater is found in monitoring wells at the Salton City municipal landfill at a depth of 20 to 32 feet below ground (CEPA 2006). The California Geologic Survey has not mapped areas within the Truckhaven Geothermal Leasing Area having potential for liquefaction or landslides as part of the Seismic Hazard Zones Program. The State's Seismic Hazards Mapping Act requires that site-specific geotechnical investigations be conducted for developments designed for human occupancy. Appropriate geotechnical studies would be required prior to exploration and development.

Subsidence and Settlement

Subsidence and settlement can be induced both by natural and human phenomena. Natural phenomena include subsidence from tectonic deformations and seismically induced settlements; and soil subsidence due to consolidation, hydrocompaction, or rapid sedimentation or oxidation of organic-rich (peat) soils. Subsidence or settlement due to human activities includes that caused by a decrease in pore pressure due to withdrawal of groundwater or hydrocarbons from the ground. Appropriate geotechnical studies would be required prior to exploration and development.

Volcanic Hazards

According to the U.S. Geological Survey, the area of the Brawley Spreading Center, located at the southeast end of the Salton Sea, has the potential for future volcanic activity. Five small rhyolite domes exist in this area and have been dated as erupting about 16,000 years ago (USGS 1989). The closest of these is Obsidian Butte located about 18 miles southeast of the proposed action area. Earthquakes and ground shaking may be associated with volcanic activity. It is judged to be very unlikely for a lava flow to impact the BLM lands in the Truckhaven area; however, an eruption could send ash into the air that could cause some minor effects to geothermal operations and electrical transmission.

4.3.4 Impacts by Alternative

Alternative 1

Under the No Action Alternative, BLM would not offer any lands for geothermal leasing. The No Action alternative would serve as a benchmark against which other alternatives are evaluated. Under this alternative, there would be no future impacts to topography, geology, or geologic hazards.

Alternative 2

Under this alternative, 11 sections of land (7,051 acres) would be offered for geothermal lease. This alternative would result in 85 acres of BLM land initially being disturbed,

with a final disturbance of 69 acres of BLM land after reclamation. The environmental consequences from this alternative are similar to that discussed in Section 4.3.3, although they would take place over a smaller area of BLM land than Alternative 3. The risk associated with these impacts would be low. Additional land could be disturbed if the State leases its lands. Under this alternative, it is assumed that up to 502 acres of BLM and non-BLM land could be disturbed in the short term and 405 acres in the long term if other lands are leased.

Alternative 3

Under this alternative, 22½ sections of land (14,731 acres) would be offered for geothermal lease. This alternative would result in 183 acres of BLM land initially being disturbed, with a final disturbance of 148 acres of BLM land after reclamation. The environmental consequences from this alternative are similar to those discussed in Section 4.3.3, although they would take place over a larger area of BLM land than Alternative 2.

4.4 Soils

4.4.1 Management Goals

The CDCA Plan goals for geology and minerals resources are as follows:

- Within the multiple-use management framework, assure the availability of known mineral resource lands for exploration and development.
- Encourage the development of mineral resources in a manner which satisfies national and local needs and provides for economically and environmentally sound exploration, extraction, and reclamation processes.
- Develop a mineral resource inventory, geology-energy-minerals database, and professional, technical, and managerial staff knowledgeable in mineral exploration and development.

Soils in the Truckhaven Geothermal Leasing Area are not used as farmland; they may be rocky, alkaline or have other limitations that make them unsuitable as farmland. In most areas, the lack of irrigation water already limits agricultural development. The nearest farmland is about 3 miles southeast of the proposed action area along the Salton Sea.

4.4.2 Impact Criteria

Geothermal exploration and development would require roads, drilling sumps, power plant facilities, and reinjection wells. All of this entails land disturbance activities requiring appropriate permits for grading and restoration. Construction and development would make the soil more vulnerable to erosion from wind and water. In the absence of BLM specific criteria, potential impacts to soils were determined in accordance with

Appendix G of the CEQA Guidelines. Analysis of impacts to soil resources in an alternative considers whether it:

- Resulted in substantial soil erosion or loss of topsoil;
- Was located on unstable strata or soil or that would become unstable as a result of the project, potentially resulting in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse;
- Was located on expansive soil creating substantial risks to life or property;
- Affected potential farmland, erosion patterns or habitats through soil removal or loss of topsoil;
- Resulted in increased runoff due to development of roads and structures, which could lead to more soil erosion; or
- Could create substantial risks to life or property if activities occurred on expansive soils, as defined in Table 18-1B of the Uniform Building Code (1994).

The engineering properties of the soils within the Truckhaven area are not known, but they would be determined prior to construction of facilities.

4.4.3 General Impacts

Due to nature of the topography, the proposed action area is relatively flat, so overall grading would be minimal. No significant soil conditions were observed or are known to exist that would preclude the proposed geothermal exploration and development in the Truckhaven area.

4.4.4 Impacts by Alternative

Alternative 1

The No Action Alternative would result in no ground disturbance. A General Permit would not be issued for construction by the Regional Water Quality Control Board. No impacts to soils would occur.

Alternatives 2 and 3

Under either of the action alternatives, construction of the geothermal wells and power plants would be subject to stormwater measures contained in a SWPPP and would include BMPs as required by a General Construction Activity Stormwater Permit issued by the California State Water Resources Control Board. The SWPPP would be subject to the review and approval of the Regional Water Quality Control Board. BMPs implemented during all phases of construction within the Truckhaven area would include road maintenance, grading, culvert maintenance and installation, water runoff control,

installation of storm drain inlet protection devices, traffic control in erosion-damaged areas, use of erosion control blankets and soil stabilizers, use of hay bales and sand bags, and mulching areas with a protective cover of organic material, such as wood chips and vegetation. Because these alternatives would include implementation of erosion control measures, erosion impacts (i.e., soil impacts) would be negligible.

4.5 Water Resources

4.5.1 Management Goals

There are no management goals for water resources in the CDCA Plan.

4.5.2 Impact Criteria

The potential risk of these indirect impacts affecting water resources is assessed with respect to six criteria. Potential impacts on water resources could occur if reasonably foreseeable future actions:

- Violate Federal, State, or local water quality standards or objectives;
- Impair existing or potential beneficial uses of waters of the U.S. or State of California;
- Result in water or sediment quality conditions that could be harmful to aquatic life or human health, even if an accepted standard were not formally violated;
- Increase the potential for a substantial off-site flood hazard (the substantial flood hazard is greater than 1 percent, or once in a hundred years);
- Result in erosion or sedimentation that would alter or impair the course of a permanent stream or substantially alter the area or capacity of a surface water feature; or
- Result in uses or facilities that would substantially degrade surface or groundwater quality.

The potential risk of indirect impacts affecting water resources from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High: If there were significant impacts on the above criteria;
- Medium: If there were moderate impacts on the above criteria; or
- Low: If there were minor or no impacts on the above criteria.

4.5.3 General Impacts

Hydrology

The Truckhaven area is undeveloped, with a primary focus on recreation. The new impervious surfaces, such well pads and power plants, would be a relatively minor source of increased surface runoff and would not substantially change runoff characteristics. Therefore, the risk associated with potential impacts to surface water hydrology would be negligible.

Surface Water Quality

The construction activities associated with geothermal exploration and development have the potential for adverse impacts to surface water quality, especially through erosion of disturbed soil from stormwater.

Groundwater Quality

Geothermal exploration and development is not expected to significantly alter the existing drainage patterns because grading the project would not require significant landform modification. The RFD scenario development of wells, pipelines, and power facilities could cause indirect impacts to surface or groundwater quality due to a pipeline rupture, leakage, or failure from a surface impoundment or well casing leakage. Pipeline, pond, or well failures could be related to a seismic event. Any facilities related to geothermal exploration and development would be designed with appropriate standards to protect against such releases. Geothermal brines near the Salton Sea are typically of such a quality that the geothermal ground water does not have other beneficial uses; thus, overdraft of this deeper groundwater is not a concern. The risk associated with potential impacts to groundwater quality or quantity is low and would not be considered adverse.

Floodplains

Major drainages in the project area such as Tule Wash and San Felipe Creek are subject to flash floods during heavy rain storms and are located within 100-year flood zones (FEMA 2006). Flash floods could cause damage to roads, pipelines, or other structures developed. Geothermal development would be sited to avoid these areas. Under both of the action alternatives, very few acres would be paved for well pads and the actual land used for power plants. Therefore, overland flow would be increased by a neglible amount and thus would not contribute to flash flood potential.

Water Supply

The source and amount of water required for potential operations of two binary plants has not been defined, and the availability and quality of groundwater within the lease area is unknown. Due to the expected low quality of nearby groundwater, it is expected that

water for drilling and operations would be purchased from a supplier such as the Coachella Valley Water Department or the Imperial Irrigation District (IID).

4.5.4 Impacts by Alternative

Alternative 1

Under the No Action Alternative, no BLM parcels would be leased and no geothermal exploration or development would take place. There would be no ground-disturbing activities or any type of construction. Therefore, there would be no impacts to surface or groundwater resources

Alternative 2

Under Alternative 2, the BLM would lease 11 sections of land (7,051 acres) for geothermal exploration and development. The indirect impact from Alternative 2 would be similar to the impacts described in Section 4.5.3 – that is, a negligible increase in potential increased stormwater runoff, erosion, and surface water quality. A more detailed environmental analysis and a groundwater study would be performed prior to commencement of drilling and construction to ensure adequate water is available. Under this alternative, some of the development would occur on BLM land and the rest would occur on adjacent state or private land. Impacts to water resources would be negligible because there would be negligible increased runoff from development.

Alternative 3

Under Alternative 3, the BLM would lease 22½ sections of land (14,731 acres) for geothermal exploration and development. The indirect impact from Alternative 3 would be similar to the impacts described in Section 4.5.3, including potential increased stormwater runoff, erosion, and surface water quality degradation. A more detailed environmental analysis and a groundwater study would have to be performed prior to commencement of drilling and construction to ensure that adequate water is available. This alternative would focus development on a greater area of BLM land than Alternative 2, which would spread the impacts to water resources over a greater area. As with Alternative 2, the risk associated with these impacts would be low.

4.6 Vegetation

4.6.1 Management Goals

The vegetative resources of the Truckhaven Geothermal Leasing Area are part of the larger CDCA. The BLM management goals for vegetation from the 1980 CDCA Plan as amended are outlined below:

- Maintain the productivity of the vegetative resource while meeting the consumptive needs of wildlife, livestock, wild horses and burros, and man. Provide for such uses under principles of sustained yield.

- Manage plant species on the Federal and State lists of threatened and endangered species and their habitats, so the continued existence of each will not be jeopardized. Stabilize and, where possible, improve populations through management and recovery plans developed and implemented cooperatively with the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (CDFG).

- Manage plant species BLM officially designated as sensitive for California and their habitats, so the potential for Federal or State listing is minimized. Include consideration of sensitive species habitats in all decisions, so impacts are avoided, mitigated, or compensated.

- Manage unusual plant assemblages, so their continued existence is maintained. In all actions, include consideration of unusual plant assemblages, so impacts are avoided, mitigated, or compensated.

- Manage wetland and riparian areas in the CDCA with the following specific objectives: (a) avoid the long-term and short-term impacts associated with the destruction, loss, or degradation of wetland and riparian area, (b) preserve and enhance the natural and beneficial values of wetland and riparian areas which may include constraining or excluding those uses that would cause significant long-term ecological damage, (c) include practical measures to minimize harm in all actions causing adverse impacts on wetlands and riparian areas, and (d) retain all wetlands and riparian habitats presently under BLM administration wherever high resource values exist and adverse impacts cannot be mitigated.

- Accomplish the objectives of other resources by altering plant composition, density, and/or cover. Objectives include eliminating harmful or noxious plants, increasing livestock or wildlife forage production, and improving wildlife habitat characteristics. Diversified native plant communities are favored over monocultures or communities based on non-native species.

4.6.2 Impact Criteria

The potential risk of these indirect impacts affecting vegetation is assessed with respect to four criteria. Potential impacts on fish and wildlife could occur if reasonably foreseeable future actions were to:

- Adversely affect a species, natural community, or habitat recognized for scientific, recreational, ecological, or commercial importance;

- Alter or destroy habitat that would prevent biological communities that inhabited the area prior to the project from reestablishing;

- Extensively alter or cause the loss of biological communities in high quality habitat for longer than one year; or

- Affect unique communities or communities of limited distribution within the project area.

The potential risk assessment of indirect impacts on vegetation from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High: If there were significant impacts on the above criteria;
- Medium: If there were moderate impacts on the above criteria; and
- Low: If there were minor or no impacts on the above criteria.

4.6.3 General Impacts

Impacts on vegetation could include:

- A net loss in the functional habitat value of a sensitive biological habitat;

- Disturbance of a substantial portion of a vegetation type within the local region to the point where natural or enhanced regeneration would not restore the resource to pre-disturbance conditions in at least three years;

- The introduction of new (or leads to the expanded range of existing) noxious weed species or soil pests, so that they substantially interfere with successful revegetation;

- An adverse effect on a species, natural community, or habitat that is recognized specifically as biologically significant in local, State, or Federal policies, statutes, or regulations; and

- Adverse impacts to vegetation from the construction of well pads, wells, ponds, power plants, access roads, pipelines, transmission lines, other generation or transmission facilities, and any temporary extra workspace. The impacts to vegetation from these activities would depend on the scale, intensity, duration, and permanence of construction activities. Potential adverse impacts could include direct mortality, loss of plant habitat, plant injury, alteration of plant community structure and community fragmentation, invasive species introduction, soil compaction and erosion, and dust, which could decrease plant photosynthesis.

- Other potential impacts to vegetation from improperly planned or poorly executed handling of geothermal fluids. Uncontrolled releases, spills, seepages, or well blowouts could result in the addition of toxic, mineralized, or saline geothermal waters to soil, streams, ponds, or wetlands. This contamination could adversely impact vegetation growth and distribution.

4.6.4 Impacts by Alternative

Alternative 1

Under Alternative 1, the BLM would not offer any additional lands for geothermal leasing. Leasing would continue as at present and would be guided by the CDCA and the regional environmental analyses for geothermal leasing in the Truckhaven Geothermal Leasing Area. As a result, there would be no additional impacts to vegetation from geothermal leasing other than what currently exists.

Alternative 2

Under Alternative 2, the BLM would offer 11 sections of land for noncompetitive leasing. In contrast to Alternative 1, Alternative 2 would increase the area available for geothermal leasing; therefore, this would increase potential impacts to vegetation. Adverse impacts to vegetation would include impacts from surface-disturbing activities associated with construction. Although BLM would require operators to implement practices to avoid or minimize potential soil contamination, there is a potential for accidents to cause soils to become contaminated with construction-related materials, such as oils, greases, and hydraulic fluids. Depending on the concentration and extent of contamination, the growth and distribution of vegetation communities may be inhibited. In addition, the pollutants or disturbed soil could be transported through surface water runoff to adjacent vegetation communities, impacting plant growth outside the immediate construction area.

Alternative 3

Under Alternative 3, the BLM would issue leases for tracts with existing noncompetitive leasing applications and offer competitive leases for all other BLM-managed lands at the Truckhaven Geothermal Leasing Area, totaling 14,731 acres. While this alternative maintains the same number of acreas that may be affected, the area of disturbance would be spread over a larger geographic area. Impacts to vegetation from ground-disturbing activities would be similar in magnitude as those described under Alternative 2.

4.6.5 Invasive Species

Invasive species thrive in disturbed areas and can be introduced by surface-disturbing activities associated with construction. Known invasive species within the project area include Sahara mustard (*Brassica tournefortii*) and saltcedar (*Tamarix* species). Both species could be introduced by any of the surface-disturbing activities associated with

geothermal leasing, development, and utilization, as previously discussed under vegetation.

Alternative 1 would have no impacts to vegetation resulting from the introduction of invasive species because no additional BLM-managed land would be made available for geothermal leasing. In comparison, Alternative 2 would potentially increase the introduction of invasive species as a result of leasing 7,051 acres. Alternative 3 would have the greatest potential impacts to vegetation on BLM land from the introduction of invasive species because this alternative proposes to lease 14,731 acres, double the acreage of Alternative 2. The area of surface disturbance would be the same for either action alternative; however, Alternative 3 would involve disturbance over a more widespread area.

4.6.6 Wetlands/Riparian Areas

Because there are no wetlands or riparian areas within or immediately adjacent to the Truckhaven Geothermal Leasing Areas, there would not be impacts from leasing or potential development of geothermal energy resources within the project area.

4.7 Fish and Wildlife (Other than Special Status Species)

4.7.1 Management Goals

Wildlife abundance and diversity varies by season and habitat type throughout the Truckhaven Geothermal Leasing Area. Furthermore, while the area has very limited suitable habitat for many of the birds from the Salton Sea, several species, such as the southwestern willow flycatcher or California brown pelican, may fly through the areas proposed for leasing. As a result, through the Wildlife Element of the CDCA Plan, the BLM has developed five goals for managing and promoting wildlife resources within the Truckhaven area:

- Avoid, mitigate, or compensate for impacts of conflicting uses on wildlife populations and habitats. Promote wildlife populations through habitat enhancement projects, so balanced ecosystems are maintained and wildlife abundance provides for human enjoyment.

- Develop and implement detailed plans to provide special management for: (1) areas that contain rare or unique habitat; (2) areas with habitat sensitive to conflicting uses; (3) areas with habitat especially rich in wildlife abundance or diversity; and (4) areas that are good representatives of common habitat types. Many areas falling into these categories contain listed species, which, as indicator species, may become the focus of management.

- Manage wildlife species on the Federal and State lists of threatened and endangered species and their habitats so their continued existence is not jeopardized. Stabilize and, where possible, improve populations through

management and recovery plans developed and implemented cooperatively with the USFWS and the CDFG.

- Manage wildlife species officially designated as sensitive by the BLM for California and their habitats, so the potential for Federal or State listing is minimized.

- Include consideration of crucial habitats of sensitive species in all decisions, so impacts are avoided, mitigated, or compensated.

4.7.2 Impact Criteria

The potential risk of indirect impacts from leasing affecting fish and wildlife is assessed with respect to five criteria. Potential impacts on fish and wildlife could occur if reasonably foreseeable future actions were to:

- Adversely affect a population by substantially reducing its numbers, causing a fish or wildlife population to drop below self-sustaining levels or causing a substantial loss or disturbance of habitat; such effects could include vehicle impacts and crushing, increased predation, and toxic effects from contaminated soils;

- Cause a substantial net loss in the functional habitat value of a sensitive biological habitat;

- Introduce invasive wildlife species, natural community, or habitat that is recognized specifically as biologically significant in Federal policies, statutes, or regulations;

- Have a substantial adverse impact on nesting migratory birds, including raptors, as protected under the Migratory Bird Treaty Act; and

- Substantially interfere with the movement of any native resident or migratory fish or wildlife species, or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

The potential risk assessment of indirect impacts affecting fish and wildlife from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High: If there were significant impacts on the above criteria;
- Medium: If there were moderate impacts on the above criteria; and
- Low: If there were minor or no impacts on the above criteria.

4.7.3 General Impacts

The Truckhaven Geothermal Leasing Area itself has no endemic aquatic resources. Because of its sandy, mountainous, and arid environment, surface water resources and fish and amphibian populations in the area are non-existent. However, approximately 2 miles to the east of the Project Area is the Salton Sea, which does support significant aquatic resources. Geothermal energy development is not expected to affect water quality or quantity of the Salton Sea (see Section 4.5.3). Therefore, fish populations in the sea would not be impacted by the proposed development.

One of the main threats to wildlife is anthropogenic activity, such as geothermal activity (USDI BLM 2003a). Geothermal activities can cause the following impacts to wildlife habitat:

- Habitat degradation or habitat loss;
- Increase in surrounding noise levels;
- Change in wildlife migrating and wintering patterns;
- Soil contamination;
- Electrocution from exposed transmission lines; and
- Obstacles to collide with (e.g., pipelines and well drilling structures).

4.7.4 Impacts by Alternative

The Truckhaven Geothermal Leasing Area encompasses 63 sections (40,320 acres). Of this, approximately 22½ sections (14,731 acres) are BLM surface and subsurface, 320 acres are private surface/Federal minerals, with the remainder being State or private land. Of the BLM land, pending geothermal lease applications cover 11 sections (7,051 acres). Based on the RFD scenario, geothermal development is not expected to affect wildlife species or their habitat by:

- Adversely affecting wildlife populations (e.g., by reducing numbers; altering behavior, reproduction, or survival; or by causing the loss or disturbance of habitat);

- Adversely affecting a species, natural community, or habitat recognized for scientific, recreational, ecological, or commercial importance;

- Impeding wildlife/avian migration routes for a period that would significantly disrupt that migration; and

- Altering or destroying habitat that would prevent biological communities that inhabited the area prior to the project from reestablishing.

The following sections detail the expected effects of each of the three alternatives on wildlife. These effects may vary depending on the total area available to leasing.

Alternative 1

Under this alternative, the BLM would not offer any additional lands for geothermal leasing. Leasing would continue at present levels and would be guided by the CDCA and the regional environmental analyses for geothermal leasing in the Truckhaven Geothermal Leasing Area. The nature of wildlife impacts would be similar to those that have occurred in the past; therefore, no additional impacts to wildlife would occur.

Alternative 2

Under Alternative 2, BLM would offer 11 sections of land for noncompetitive leasing. Only tracts for which BLM currently has noncompetitive lease applications would be leased under this alternative.

Impacts during exploration would be low, as a reduced amount of machinery would be used in localized areas. Although specific habitat loss would impact wildlife use, species would be not impacted regardless of their habitat types.

Impacts from development of drilling areas and surrounding infrastructure would include loss or degradation of vegetation used by wildlife and the potential for habitat fragmentation. Geothermal infrastructure, including wells and pipelines, would reduce available habitat. Hot water pipelines from the wells to the power plants are unlikely to harm wildlife within the immediate vicinity, as they are insulated, reducing thermal loss while protecting wildlife. Above-ground pipelines would not affect small animal mobility because they would be placed at least 12 inches above the ground surface to allow wildlife mobility and facilitate natural drainage.

Prolonged noise from geothermal operations could adversely affect some lizards and small mammals. Hearing loss in small animals, such as lizards, occurs around 100 dBA (USDI BLM 2003b). However, exposure to noise by wildlife would be localized to the surrounding geothermal development and would not impact the greater surrounding area. The operation of power plants and related facilities produces sound levels of approximately 100 dBA at distances between 3 to 50 feet (USDI BLM 2003a), while the distance between the noise source and the edge of the undisturbed habitat should be greater than 50 feet. Thus, dBA levels should be lower than 100 dBA for wildlife in the undisturbed habitat.

Some of the distribution lines would be buried in or adjacent to access roads, which would reduce migratory bird strike impacts from structures and lines. During the closedown phase of geothermal operations, damage due to project development would be repaired as structures and equipment are removed and rehabilitation efforts are initiated.

Alternative 3

Under Alternative 3, BLM would issue leases for tracts with existing noncompetitive leasing applications and offer competitive leases for all other lands at Truckhaven,

totaling 14,731 acres. Because of the increased geographic extent of impacts under this alternative, impacts to the surrounding habitat would increase compared to those under Alternative 2. To reduce or eliminate adverse impacts to wildlife habitat associated with geothermal leasing and subsequent exploration, development, operation, and closure, several levels of mitigation measures may be applied. Appropriate mitigation, such as stipulations attached to lease notices and subsequent leases, would be developed as part of the NEPA process and would become part of all action alternatives (see Section 2.1.5). Mitigation measures may include elevating all pipelines outside of a power plant site or other fenced area at least 12 inches above the ground surface to allow wildlife mobility and prevent interference with natural drainage; or keeping all vehicles on the roads and not permitting any off-road vehicle travel, parking, or storage without prior approval from the authorized officer of the BLM. This would reduce unnecessary disturbance of wildlife habitat. If these vehicles must travel off-road, then raking or other rehabilitation measures would be required immediately after such travel occurred, by means acceptable to the authorized officer.

4.8 Special Status Species

The effects on special status species would generally be associated with ground disturbance and increased human access within the Truckhaven Geothermal Leasing Area. Impacts that affect special status plant and animal species are similar to those described for vegetation and wildlife. Therefore, this section provides a summary of impacts specific to the groups of special status species known or likely to occur within the Truckhaven Geothermal Leasing Area as a result of the proposed action and alternative actions.

4.8.1 Management Goals

The following are the management goals from the CDCA Plan Wildlife Element that pertain to special status species and their habitat:

- Develop and implement detailed plans to provide special management for: (a) areas which contain rare or unique habitat; (b) areas with habitat sensitive to conflicting uses; (c) areas with habitat especially rich in wildlife abundance or diversity; and (d) areas which good representative of common habitat types. Many areas falling into these categories contain listed species, which may become the focus of management as indicator species.

- Manage those wildlife species on the Federal and State lists of threatened and endangered species and their habitats, so the continued existence of each is not jeopardized. Stabilize and, where possible, improve populations through management and recovery plans developed and implemented cooperatively with the USFWS and the CDFG.

- Manage wildlife species officially designated as sensitive by the BLM for California and their habitats, so the potential for Federal or State listing is minimized.

- Include consideration of crucial habitats of sensitive species in all decisions, so impacts are avoided, mitigated, or compensated.

4.8.2 Impact Criteria

The potential risk of these indirect impacts affecting special status species is assessed with respect to two criteria; impacts to special species would include those mentioned in the Fish and Wildlife section as well as the following:

- A substantial, adverse effect, either direct or indirect, on any listed, proposed, or candidate endangered or threatened species listed under the Endangered Species Act, including substantially reducing the number or restricting the range of a threatened or endangered plant or animal; and

- A substantial permanent adverse effect on wetland, riparian, or other sensitive habitat identified in regional plans, policies, or regulations, or by the USFWS.

The following definitions of high, medium, and low are used in assessing the potential for indirect impacts from the proposed action:

- High: If there were significant impacts associated with the above criteria;
- Medium: If there were moderate impacts associated with the above criteria; and
- Low: If there were minor impacts associated with the above criteria.

4.8.3 General Impacts

In general, geothermal energy development could adversely affect special status species by reducing, fragmenting, polluting or otherwise diminishing habitat quality and quantity. Noise impacts may adversely affect species that are sensitive to high noise levels.

As shown in Table 4-7, six plant species are listed as having a high potential, four plant species are listed as having a moderate potential, and one species has a low potential for occurrence in the proposed action area.

While suitable habitat for these plants occurs within the proposed action area, none of the listed plant species occur in it. Therefore, drilling and construction would not have any direct impact on these listed plant species, but could disturb potential habitat.

Infrastructure could also create perches for avian predators, which could negatively impact small species, including the flat-tailed horned lizard. The BLM has gone to extensive lengths to protect the flat-tailed horned lizard and its habitat in Management Areas. As a result, the proposed action would include the following environmental protection measures to minimize the potential impact to the flat-tailed horned lizard:

- Comply with the applicable mitigation and compensation measures set forth in the *Flat-tailed Horned Lizard Rangewide Management Strategy*;
- Fund and implement a flat-tailed horned lizard protective signing program along all roads within the proposed action area;
- Surface (with asphalt, gravel, chemical or physical stabilizers or other surfacing acceptable to the authorized officer of the BLM) all new access roads within the proposed action area to reduce the amount of time that flat-tailed horned lizards may spend on these access roads; and
- Agree that the BLM reserves the right to require additional mitigation measures should monitoring of the flat-tailed horned lizard populations within the proposed action area by the BLM show an appreciable decrease in relative abundance which is not correlated with decreases in neighboring, undeveloped sections, or if impacts unacceptable to the authorized officer are observed to either the flat-tailed horned lizard population or its habitat.

Table 4-7 Plant Species with Habitat in Truckhaven Geothermal Leasing Area

Species	Potential for Occurrence
Harwood's milkvetch (*Astrgalus insularis* var. *harwoodii*)	High
Elephant tree (*Bursera microphylla*)	Moderate
Crucifixion thorn (*Castela emoryi*)	Moderate
Pierson's pincushion (*Chaenactis carphoclina* var. *peirsonii*)	High
Flat-seeded spurge (*Chamaesyce platysperma*)	Low
Brown turban (*Malperia tenuis*)	High
Robison's monardella (*Monardella robinsonii*)	Absent
Sand food (*Pholisma sonorae*)	High
Orocopia sage (*Salvia greatae*)	Moderate
Cove's senna (*Senna covesii*)	Moderate
Mecca aster (*Xylorhiza cognate*)	High
Orcutt's woody-aster (*Xylorhiza orcuttii*)	High

Implementation of the *Flat-tailed Horned Lizard Rangewide Management Strategy* mitigation measures would assure that the minimum amount of this new surface disturbance occurs on lands within the proposed action area, and that all appropriate actions are taken to minimize the adverse effects on flat-tailed horned lizards and its habitat.

Especially important would be the loss of extensive desert pavement areas with loose sand and the loss of partially stabilized dunes, which are prime habitat for the flat-tailed

horned lizard. To maintain habitat outside the fenced power plant areas, all vehicles associated with the power plant facility and its development would be kept on the roads and not permitted to conduct any off-road vehicle travel, parking, or storage without prior approval from the authorized officer of the BLM. This would reduce unnecessary disturbance of wildlife habitat. If these power plant-associated vehicles must travel off-road, then raking or other rehabilitation measures would be required immediately after such travel occurred, by means acceptable to the authorized officer. With these mitigations, impacts to flat-tailed horned lizard habitat would be negligible; sufficient habitat would remain to ensure species viability in the area.

Impacts from the infrastructure to avian species migrating through the proposed action area, such as pelicans, would be negligible as the transmission lines would be buried, decreasing the potential mortality of listed, proposed, or candidate endangered or threatened avian species. Of the eight avian species listed and that may potentially occur within the proposed action area, only LeConte's thrasher is listed as having a high potential for impacts, as there are recorded occurrences of this species in both the project area and the surrounding area. This species is sensitive to disturbance, but populations are found in low density and are therefore hard to find. Noise levels from localized machinery during construction may contribute to impacts to LeConte's thrasher in the area, but combined with other noise generators, such as OHV use, it would likely be unnoticeable to this species. Disturbance to their habitat may also result from the proposed development. Direct crushing or removal of vegetation that this species occupies would also impact populations of this species in the area.

The desert pupfish is absent from the proposed action area; however, impacts to desert pupfish populations outside the area are uncertain. A groundwater study would be performed prior to commencement of drilling and construction to determine what impact (if any) would occur to freshwater aquifer that feeds pools the pupfish occupy south of the construction area.

4.8.4 Impacts by Alternative

The Truckhaven Geothermal Leasing Area encompasses 63 sections (40,320 acres). Of this, approximately 22½ sections (14,731 acres) are BLM surface and subsurface, 320 acres are private surface/Federal minerals, with the remainder being State or private land. Of the BLM land, pending geothermal lease applications cover 11 sections (7,051 acres). Based on the RFD scenario, geothermal development may impact special status species over the short- or long-term if it would:

- Adversely affect a population of a threatened, endangered, regulated, or other sensitive species (e.g., by reducing numbers; altering behavior, reproduction, or survival; or by causing the loss or disturbance of habitat); any "take" of a listed or sensitive species is considered significant;

- Adversely affect a species, natural community, or habitat that is specifically recognized as biologically significant in local, State, or Federal policies, statutes, or regulations;
- Adversely affect a species, natural community, or habitat that is recognized for scientific, recreational, ecological, or commercial importance;
- Alter or destroy habitat that would prevent special status species that inhabited the area prior to the project from reestablishing; or
- Affect unique communities or communities of limited distribution within the project area.

The following sections detail the expected effects of each of the three alternatives on special status species. These effects may vary depending on the total area available to leasing.

Alternative 1

Under this alternative, the BLM would not offer any additional lands for geothermal leasing. Leasing would continue at present levels and would be guided by the CDCA and the regional environmental analyses for geothermal leasing in the Truckhaven Geothermal Leasing Area. The nature of biological impacts would be similar to those that have occurred in the past from existing use; therefore, no additional impacts to special status species would occur.

Alternative 2

Under Alternative 2, BLM would offer 11 sections of land for noncompetitive leasing. Only those tracts for which BLM currently has noncompetitive lease applications would be leased under this alternative.

There is suitable habitat for 10 of the 12 special status-listed plants to potentially occur in the proposed action area (see Table 3-5). Desert plants such as these are susceptible to ground-disturbing activities, which can cause the direct loss of individual plants and may alter the habitat so native plants cannot reestablish. Although suitable habitat for these plants is present, none of the listed plant species are found in the area. Therefore, loss of individual plants as a result of construction is not expected, although there would be a reduction of potential habitat for these plants to colonize. In many cases, non-native species, such as tamarisk, are able to out-compete listed native species, such as Harwood's milkvetch, Pierson's pincushion, sand food, Mecca aster, or Orcutt's woody-aster, and successfully colonize the disturbed area.

Vehicles involved in exploration, well development, and construction may spread non-native species as they travel to and from work sites. Increased human and vehicle traffic would result in trampling, soil compaction, and direct damage to plants.

The two primary special status wildlife species known to be present in the Truckhaven Geothermal Leasing Area are the flat-tailed horned lizard and the Colorado Desert fringe-toed lizard. Other special species likely to occur in the Truckhaven area are transient bird and bat species that may fly over the proposed action area.

Potential impacts to the flat-tailed horned lizard population of the Truckhaven Geothermal Leasing area are described in the wildlife section above. The relatively low clutch sizes of flat-tailed horned lizards and their large home ranges means that surface-disturbing activities, such as geothermal production, may affect local populations. This species freezes in response to danger, which makes it susceptible to mortality on roads and other areas of activity. Development of infrastructure would reduce available sandy habitat and may not only crush lizards but also crush and destroy their burrows. Burying pipeline within identified flat-tailed horned lizard habitat would only temporarily disturb this habitat, although disturbance of the sandy habitat is restricted to a narrow band. Predator densities often increase near human development (USDI BLM 2003b). The potential increase in predation could have adverse impacts to local lizard populations near the geothermal infrastructure. Overall, power plant construction, wells, pipelines, transmission lines, and service roads all contribute to habitat loss and degradation of the flat-tailed horned lizard. Impacts on the Colorado Desert fringe-toed lizard population would be similar to those affecting the flat-tailed horned lizard, but the number of incidences would be lower due to the reduced acreage of this lizard's preferred habitat (i.e., eolian sand dunes) within the proposed action area.

Alternative 3

Although there would twice as many BLM lands open for leasing under this alternative, impacts to surrounding habitat would not double when compared to those mentioned in Alternative 2.

Appropriate mitigation, such as stipulations attached to leases and subsequent Plans of Development, would be developed as part of the NEPA process and would become part of all action alternatives. Adaptive management techniques would be utilized to minimize impacts to special status species present in the proposed action area. These techniques would include BLM's goals for managing and promoting special status resources within the Truckhaven area. Additionally, whenever possible, vehicle traffic would be relegated to existing roads. Before new drilling pads or other land disturbance is conducted, surveys of the affected areas would be conducted to identify any special status species populations to be avoided in the area. The sparse existing vegetation and low species diversity makes identification of special status populations less difficult. As a result, overall impacts to special status species under Alternative 3 would be minor and species' ability to persist would not be impaired.

In simple comparative terms, both action alternatives would disturb the same number of acres and would, therefore, potentially impact special status species in equal amounts. Until there is a defined project with precise methods and proposed locations identified, specific impacts cannot be determined at this time. However, given the flexibility of

locating geothermal energy infrastructure, it is expected that impacts to special status species would be negligible under either alternative.

4.9 Cultural Resources

4.9.1 Management Goals

The following are management goals from the CDCA Plan of 1980, as amended:

- Broaden the archaeological and historical knowledge of the CDCA through continuing inventory efforts and the use of existing data. Continue the effort to identify the full array of the CDCA's cultural resources. Preserve and protect representative sample of the full array of the CDCA's cultural resources. Ensure that cultural resources are given full consideration in land use planning and management decisions, and ensure that BLM authorized actions avoid inadvertent impacts. Ensure proper data recovery of significant (National Register quality) cultural resources where adverse impacts can be avoided.

4.9.2 Impact Criteria

The potential risk of these indirect impacts is assessed with respect to four criteria. Potential impacts on these resources could occur if reasonably foreseeable future actions:

- Isolate the property or alter the character of the property's setting when that character contributes to the property's qualifications for the National Register of Historic Places;

- Introduce visual, audible, or atmospheric elements that are out of character with the property or changes that may alter its setting;

- Cause a property to be neglected, resulting in its deterioration or destruction; or

- Result in the transfer, lease, or sale of a property without adequate provisions to protect the property's historic integrity.

The potential risk assessment of indirect impacts affecting historic properties from exploration, development, production, or closeout is based on a scale that rates each area from high to low. The following definitions of high, medium, and low for cultural resources are assigned according to the potential future risk of indirect impacts in the region of influence:

- High sensitivity: Describes an area that may have numerous recorded resources, where significant or numerous resources have been recorded, that are a part of a delineated National Register of Historic Places historic district, or where landforms or topographic qualities are known to be highly sensitive.

- Medium sensitivity: Describes an area where there may be some recorded resources, where some nearby sites have been surveyed but no recorded resources have been found, or where landforms and topography suggest the presence of unrecorded resources.

- Low sensitivity: Describes an area where sites have been previously recorded but not surveyed, where some portions of the sites have been surveyed, where surveys of nearby sites were negative, or where landform and topography do not suggest the likelihood of unrecorded significant resources.

Criteria for determining potential sensitivity include proximity to the Lake Cahuilla shoreline, amount of habitable terrain, and surface stability. Typical impacts from geothermal development and exploration would be likely to occur from any ground-disturbing activities, including the development of wells sites, access road grading, pipeline and transmission line construction, and at binary power plant locations. Impacts would also be able to occur at staging and equipment storage areas. The potential for impacts to previously unknown buried sites would most likely be at cut and fill operations (for example, at water impounds or for any trenching). Uncontrolled water runoff may also occur at test wells if a site is located downslope from the drill site.

4.9.3 General Impacts

Approximately 20 percent of the Truckhaven Geothermal Leasing Area has been previously surveyed by more than 24 previous investigations. Previous surveys have identified areas with no cultural resources, widely dispersed cultural resources, or badly eroded light artifact scatters of limited scientific value. Some of these areas are located within the sandstone badlands in the southeastern portion of Truckhaven Geothermal Leasing Area and in the heavily deflated (eroded) western zone.

Direct impacts to cultural resources can potentially occur wherever there are ground-disturbing activities such as the types specified in Section 2.2, Reasonably Foreseeable Development Scenario. These impacts are most substantial during the exploration and development phases, such as during construction of the power plant, well sites, access roads, pipeline routes, and transmission lines. These activities can damage surface and subsurface artifacts, compromise the original spatial relationships of artifacts that archaeologists use to reconstruct prehistoric cultural patterns, destroy stratigraphic relationships of buried deposits, contaminate radiocarbon samples and paleo-ecological data, and damage the integrity of buried archaeological features such as hearths and cooking pits, house pits, fish traps, and cremation burials. Native American spiritual values and sensitivities are also profoundly affected by disturbance of archaeological sites, especially burials or ceremonial features. These disturbances include the well sites as well as the access roads and pipeline routes that accompany each well. Direct impacts can occur within a 2-acre area around each well site as a result of grading, equipment and vehicular staging, and drilling operations. Sites located downslope from well sites also can receive impacts from erosion or siltation from water runoff. Each of the two binary power plants would disturb approximately 17 acres and require at least 1 mile of graded

access road and 5 miles of transmission line. Impacts can also occur during the closeout phase due to additional ground disturbance from plant removal and rehabilitation.

From the research conducted as part of this document, it is likely that the proposed development would impact cultural resources associated with Ancient Lake Cahuilla. These resources range from habitation sites, flaking stations, temporary campsites, fishing weirs or traps, ceramic scatters and occasional rock cairns. Cremated burials have also been found within the project site.

The geothermal development can be expected to impact a variety of cultural resources. It is possible to abate some of the disturbance by moving the location of the wells, structures and access roads to avoid impacting sites. It this is not possible then testing and data recovery excavations can be undertaken to mitigate the impacts to a less than significant level. Due to the high density of archaeological sites within the project site mitigation monitoring should be implemented for all ground disturbing activities.

Table 4-8 lists currently available information on the distribution of known archaeological sites, which will allow for a preliminary evaluation of the archaeological sensitivity of various ranges and section in the Truckhaven area.

Table 4-8 Potential Sensitivity for Cultural Resources in Leasing Areas

Township/ Range	Section	Area Surveyed (estimate)	Sensitivity	Comments
Non-Competitive Leasing Areas				
11S, 9E	2	60 percent	High	
11S, 9E	12	>1 percent	Moderate	
11S,10E	6	25 percent	High	
11S, 10E	8	40 percent	High	
11S, 10E	18	20 percent	Low	heavily eroded
11S, 10E	28	10 percent	Low	
11S, 10E	30	25 percent	Low	
11S, 10E	32	20 percent	High	
11S, 10E	34	5 percent	Low	
12S, 10E	4	20 percent	Moderate	
12S, 10E	6	20 percent	Moderate	
Competitive Leasing Areas				
11S, 9E	10	>1 percent	Moderate	
11S, 9E	14	35 percent	High	
11S, 9E	22	0 percent	Low	
11S, 9E	24	10 percent	High	
11S, 9E	26	5 percent	Low	
11S, 10E	20	25 percent	High	
11S, 10E	22	75 percent	High	

Table 4-8 Potential Sensitivity for Cultural Resources in Leasing Areas

Township/ Range	Section	Area Surveyed (estimate)	Sensitivity	Comments
12S, 9E	2	0 Percent	Moderate	
12S, 9E	10	10 Percent	High	
12S, 9E	12	15 percent	High	
12S, 10E	8	20 percent	High	
12S, 10E	10	20 percent	Moderate	

4.9.4 Impacts by Alternative

Alternative 1

Under the No Action Alternative, BLM would not offer any lands for geothermal leasing. No impacts to cultural resources would occur as a result of geothermal energy development.

Alternative 2

Under Alternative 2, BLM would offer 11 sections (7,051 acres) of land for noncompetitive leasing for the lands currently nominated. A total of 35 sites have been previously identified in these areas. Based on previous investigations and known site locations, a preliminary assessment of potential sensitivity for historic properties can be made for each section (see Table 4-8). Although some sections have not been surveyed or were only minimally investigated, sufficient information from adjacent sections is available to indicate the potential for occurrence of historic properties. The type of potential impacts from implementation of Alternative 2 would be similar to the typical impacts from geothermal exploration and development described in Section 2.2; however since the area to be leased is much smaller in acreage the magnitude of impacts to sites would be less. Mitigation of impacts would follow the Secretary of the Interior's Guidelines for the Treatment of Cultural Properties and for implementation of Section 106 of National Historic Preservation Act.

Site disturbance can occur during the development of access roads, well pads, structure construction, associated power transmission and maintenance of facilities. Any work that requires ground disturbing activities can potentially impact cultural resources. In Alternative 2 only four sections proposed for leasing have low potential for containing cultural resources. The remaining seven sections have been assigned a level of moderate or high potential. This implies that ground disturbing activities are likely to impact cultural resources and mitigation measures for testing and/or data recovery (if required) and construction monitoring should be implemented.

Alternative 3

Under Alternative 3, BLM would issue leases for tracts with existing noncompetitive leasing applications and would offer competitive leases for all other BLM-managed lands

at the Truckhaven Geothermal Leasing Area. This would effectively double the total acreage of Alternative 2 to 14,731 acres. Potential impacts to cultural resources would therefore appreciably increase compared to Alternative 2. A total of 167 sites are currently recorded in these sections, of which several are among the largest Lake Cahuilla habitation sites in the area. Many more likely remain unrecorded, particularly in the northernmost 30 sections. Additional site concentrations occur in the southernmost tier of sections, with low site occurrences in the uplifted sandstone outcrops to the north and heavily deflated areas to the west. Nevertheless, 10 of the 12 competitive leasing sections are ranked as medium to high in sensitivity for impacts to cultural resources. This implies that ground disturbing activities are likely to impact cultural resources and mitigation measures for testing and/or data recovery (if required) and construction monitoring should be implemented.

4.10 Paleontological Resources

4.10.1 Management Goals

Planning and management actions for paleontological resources on BLM lands are implemented in accordance with the BLM Manual H-8270-1, General Procedural Guidance for Paleontological Resource Management (7/13/98); Management of Museum Collections (DM 411); the Federal Land Policy and Management Act; NEPA; and other specific Federal regulations outlined in BLM Manual H-8270-1. BLM policy laid forth in these guidelines promotes the scientific, education, and recreational uses of fossils on public lands, mitigates resource conflicts, and develops strategies to regularly monitor public lands where important paleontological localities have been identified. Additionally, the following CDCA management goals apply to the protection of cultural resources:

- Ensure paleontological resources are given full consideration in land-use planning and management decisions.
- Preserve and protect a representative sample of the full array of the CDCA's paleontological resources.
- Ensure proper data recovery of significant paleontological resources where adverse impacts cannot be avoided or otherwise mitigated.

4.10.2 Impact Criteria

The potential risk of these indirect impacts is assessed with respect to two criteria. Potential impacts on these resources could occur if reasonably foreseeable future actions:

- Isolate the property or alter the character of the property's paleontological setting when that character contributes to the property's paleontological qualifications for special status; or

- Result in the transfer, lease, or sale of a property without adequate provisions to protect the property's paleontological integrity.

The potential risk of indirect impacts affecting paleontological resources from exploration, development, production, and closeout is based on a scale that rates the paleontological sensitivity of each area from high to low. The following definitions of high, medium, and low sensitivity are assigned according to the potential that paleontological resources are present within the APE, which could be at risk of indirect impacts from the development. It should be noted that a low sensitivity area does not denote a geologic formation that is devoid of paleontological resources; rather, it refers to a formation that has not had many significant paleontological finds to date. There may still be highly significant fossils within that deposit:

- High sensitivity: Describes areas that may have numerous recorded paleontological resources, where significant or numerous resources have been recorded or whose landforms or topographic qualities are known to be highly sensitive.

- Medium sensitivity: Describes areas where there may be some recorded paleontological resources, where some nearby paleontological sites have been surveyed but no recorded resources have been found, or where landforms and topography suggest the presence of unrecorded paleontological resources.

- Low sensitivity: Describes an area where paleontological sites have been previously recorded but not surveyed, where some portions of the sites have been surveyed with negative results, where surveys of nearby sites were negative, or where landform and topography do not suggest the likelihood of unrecorded significant paleontological resources.

- To date, there have been no known reconnaissances or intensive-level paleontological assessments within the TGLA. Jefferson (2007) states that: "…where local intensive surveys have been performed…significant vertebrate remains were identified."

4.10.3 General Impacts

As stated in Section 3.10, microfossils, shells, and plant fragments can be expected within the proposed lease areas. Vertebrate fossils have not been identified in the Truckhaven area but are found in the Anza-Borrego Desert State Park to the west. Given the nature and extent of these paleontological resources, impacts to potential fossil localities can be expected.

Formations containing vertebrate fossils are considered more sensitive because vertebrate fossils tend to be rare and fragmentary and may provide important scientific data. Formations containing microfossils, plant casts, and invertebrate fossils also are more common. A significant fossil deposit is a rock unit or formation with contains significant

nonrenewable paleontologic resources. Significant non-renewable paleontologic resources are fossils and fossiliferous deposits, here restricted to vertebrate fossils and their taphonomic and associated environmental indicators. Invertebrate and botanical fossils may be significant as environmental indicators associated with vertebrate fossils or may have scientific importance if they are rare or provide stratigraphic or tectonically important data. The proposed action could result in disturbance of geologic formations with paleontological resource potential throughout the lease area.

4.10.4 Impacts by Alternative

Alternative 1

Under the No Action Alternative, BLM would not offer any lands for geothermal leasing. The No Action Alternative serves as a benchmark against which the other alternatives are evaluated. Under this alternative, there would be no change from current conditions to paleontological resources.

Alternative 2

Under this alternative, 11 sections of land (7,051 acres) would be offered for geothermal lease. Environmental consequences are discussed above in the general impacts section and would be greater than Alternative 1 but would potentially be less than or similar to Alternative 3.

Alternative 3

Under this alternative, 22½ sections of land (14,731 acres) would be offered for geothermal lease. Environmental consequences are discussed above in the general impacts section. This alternative could lead to the greatest impact to paleontological resources and could offer the potentially greatest geothermal energy production. Because Alternative 3 has the potential to disturb the land over a wider area (hence, the most paleontological resources), it could have greater long-term impact compared to Alternatives 1 and 2. With increased use and access, more paleontological resources may be found with increased development.

4.11 Visual Resources

4.11.1 Management Goals

From the CDCA Plan (USDI BLM 1999):

> The CDCA has a superb variety of scenic values. The public considers these scenic values a significant resource. The Bureau recognizes these values as a definable resource and an important recreation experience. These visual resources will receive consideration in Bureau of Land Management resource management decisions.

Many management activities involve alteration of the natural character of the landscape to some degree; the Bureau will take the following actions to effectively manage for these activities:

- The appropriate levels of management, protection, and rehabilitation on all public lands in the CDCA will be identified, commensurate with visual resource management objectives in the multiple-use class guidelines.
- Proposed activities will be evaluated to determine the extent of change created in any given landscape and to specify appropriate design or mitigation measures using the Bureau's contrast rating process.

4.11.2 Impact Criteria

For the purposes of the Final EIS, potential impacts on visual resources could occur if reasonably foreseeable future actions were to result in:

- Substantial adverse effects on a scenic vista;
- Substantial damage to scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic roadway;
- Substantial degradation of the existing visual character or quality of the site and its surroundings; or
- Creation of a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

4.11.3 General Impacts

All land-disturbing activities directly affect the visual resource. The degree to which visual resources are affected depends on the location, size, color, and viewing location of the development.

Generally speaking, alternatives with high levels of geothermal development have the highest potential for decreasing scenic quality. Ground-disturbing activities such as road and power plant construction have the potential of not blending with the natural character of the landscape. Construction of transmission lines that would interconnect with the IID 230-kV line would also have the potential to degrade the landscape, though to a much lesser degree.

Development of geothermal resources could directly affect visual resources in the following ways:

- Visual impacts from steam dissipating into the atmosphere;
- Visibility of cooling towers from two likely power plants;

- Visibility of roads and transmission lines; and
- Physical alteration of the landscape, resulting in scenic quality impacts.

4.11.4 Impacts by Alternative

The following sections detail the expected effects of each of the three alternatives on visual resources. These effects may vary depending on the total area available to leasing.

Alternative 1

Under Alternative 1, the BLM would not offer any additional lands for geothermal leasing. There would be no future impacts to visual resources from geothermal energy development in the leasing area.

Alternative 2

Under Alternative 2, the BLM would offer 11 sections (7,051 acres) of land for noncompetitive leasing for the lands currently nominated. Only those tracts for which BLM currently has noncompetitive lease applications would be leased under this alternative.

Two new power plants could be constructed under this alternative over the next several years. The specific locations for these new facilities have not been identified, although they would be located within the leasing area. New power plants would likely be similar in design to the existing binary power plants at East Mesa (Ormesa), with the cooling tower likely the most visible component at each plant. Each power plant would also require a transmission line up to 5 miles in length to be built to interconnect with IID near State Route (SR)-86. The construction of two power plants and two transmission lines would be visible in the foreground and middle-ground distance zone from low sensitivity viewpoints. This assumes neither would be built in the rolling and occasional steep topographic features visible near SR-78. Since neither would be visible from SR-78, a significant impact would not occur.

Because of the low relief and partial visibility of the area and the distance to any location with a substantial number of highly sensitive viewers, the leasing area would remain in conformance with the existing BLM Visual Resource Management (VRM) objectives for VRM Class III and Class IV Management Areas.

Alternative 3

Under Alternative 3, BLM would issue leases for tracts with existing noncompetitive leasing applications and offer competitive leases for all other lands at Truckhaven, totaling 14,731 acres. These leases would be issued with standard resource protection stipulations.

This alternative would have the same number of power plants and transmission lines as Alternative 2, but it would result in additional geothermal wells and associated roads/underground pipelines potentially visible from low-sensitivity viewpoints (Pole Line Road and SR-86). Additionally, the added roads and pipeline networks would result in low to moderate impacts found within the VRM Class III and Class IV Management Areas.

Given the low desert climate, water cooling would be likely used for any future development. Water cooling would result in steam plumes from the cooling towers that would rise up to several hundred feet above the cooling towers on cold days. During the hot summer months, the steam plume would be minimal.

Power plant cooling towers would be the tallest and most visible part of the power plants, as they would be approximately 45 feet tall and would release a condensate plume that, under some atmospheric conditions, would extend much further into the sky and be visible for miles from the power plants. Assuming the power plants would occur near existing wells, most of the power plants would not be visible from high-sensitivity viewpoints (along SR-78). Since the power plants would not be visible from SR-78, a significant impact would not occur. It is possible the steam plume could be visible from SR-78; however, the visibility of this steam plume would be viewed from more than 7 miles from its assumed location. This would result in a minor impact. The potential geothermal facilities would be painted colors that complement the desert environment and would not dominate the view of the desert landscape from typical public observation perspectives such as from SR-86, located approximately 2 miles east of the assumed power plant locations.

While the occasional plume and the power plants would be visible, since the area is within VRM Class III and Class IV Management Areas, the impact would not be considered significant. Because of the low relief and partial visibility of the area and the distance to any location with a substantial number of highly sensitive viewers, the leasing area would remain in conformance with the existing BLM VRM objectives for Class III and Class IV Management Areas.

4.12 Lands and Realty

4.12.1 Management Goals

The CDCA Plan set forth the following management goals for land tenure adjustments, but not for other elements of the lands and realty program:

- Fully implement the network of joint-use planning corridors to meet projected utility needs to the year 2000; and
- Identify potential sites for geothermal development, wind energy parks, and power plants.

According to the Imperial County General Plan, the planning and design of transmission lines within Imperial County seeks to minimize impacts to agricultural lands, wildlife, and the natural desert landscape, and requires locating lines in designated Federal and IID corridors.

In addition, the West-wide Energy Corridor Programmatic EIS is currently being developed to evaluate issues associated with the designation of energy corridors on Federal lands in 11 western states, including California. Based on the information and analyses developed in this Programmatic EIS, each agency would amend its respective land use plans by designating a series of energy corridors. One of the proposed corridors would accommodate electric transmission lines bringing electricity produced at the Truckhaven Geothermal Leasing Area to market. This Programmatic EIS would assist in planning and designation of an energy corridor though the Truckhaven area.

4.12.2 Impact Criteria

The potential risk of these indirect impacts affecting land use is assessed with respect to two criteria. Potential impacts on land use could occur if reasonably foreseeable future actions were to:

- Conflict with multiple-use management of lands administered by the BLM; or
- Result in proposed uses that are incompatible with existing or adjacent land uses.

The potential risk of indirect impacts affecting land use from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High: If there were significant impacts on the above criteria;
- Medium: If there were moderate impacts on the above criteria; and
- Low: If there were minor or no impacts on the above criteria.

4.12.3 Impacts by Alternative

Alternative 1

Under the No Action Alternative, BLM would not approve the existing noncompetitive lease applications or offer any other lands for leasing. This alternative would not permit further geothermal leasing and would be inconsistent with the intent of the Geothermal Steam Act, the National Energy Policy, and Executive Order 13212, which encourages State agencies to identify potential sites for geothermal development, expedite their review of permits, or take other actions as necessary to accelerate completion of such projects. Additionally, under the No Action Alternative, no new surface right-of-way (ROW) grants would be required.

Alternatives 2 and 3

As discussed in Section 1.6, BLM lands within the CDCA have been designated geographically into four multiple use classes: C (controlled), L (limited use), M (moderate use), and I (intensive use). Lands within the Truckhaven area are designated Class M. Class M is based upon a controlled balance between higher intensity use and protection of public lands. This class provides for a wide variety of present and future uses, such as mining, livestock grazing, recreation, energy, and utility development. Class M management is also designed to conserve desert resources and to mitigate damage to those resources caused by permitted uses. Geothermal development under either leasing scenario would not conflict with BLM's multiple-use management objectives. These scenarios would also conform to the CDCA goal to identify potential sites for geothermal development.

Leasing the subsurface geothermal resources would not affect existing realty agreements. However, development of facilities, including ROWs, would require new grants. The existing BLM realty program would be able to accommodate the need for additional ROW grants.

The Salton City Municipal Solid Waste Management Facility is within a noncompetitive lease application area, but the surface is owned by the County. Above-ground geothermal facilities would avoid the landfill.

4.13 Human Health and Safety/Hazardous Materials

4.13.1 Management Goals

The CDCA Plan does not set out specific goals for human health and safety or management of hazardous materials. However, it is BLM's stated policy to reduce threats to public health, safety, and property. In addition, in accordance with the Federal Land Policy and Management Act, BLM is required to comply with State standards for public health and safety. Additionally, the CDCA multiple-use classifications do not allow hazardous or non-hazardous waste disposal sites on public lands, except where landfills are suitable; the public lands may be transferred to the appropriate owner/operator.

4.13.2 Impact Criteria

The potential risk of these indirect impacts involving human health and safety/hazardous materials is assessed with respect to four criteria. Potential impacts involving human health and safety/hazardous materials could occur if any of the following were to take place:

- Reasonably foreseeable future actions create a hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;

- Reasonably foreseeable future actions create a hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;

- Reasonably foreseeable future actions emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one quarter mile of an existing or proposed school; or

- Reasonably foreseeable future actions are located on a site which is included on a list of hazardous materials sites compiled by the Federal or State government and, as a result, would create a hazard to the public or the environment.

The potential risk of indirect impacts involving human health and safety/hazardous materials from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High: The risk of potential indirect impacts would be high if significant impacts to the above criteria occurred during exploration, development, production, or closeout;

- Medium: The risk of potential indirect impacts would be medium if moderate impacts to the above criteria occurred during exploration, development, production, or closeout; and

- Low: The risk of potential indirect impacts would be low if minor or no impacts to the above criteria occurred during exploration, development, production, or closeout.

4.13.3 General Impacts

Impacts to human health and safety from geothermal energy development could include the introduction of hazardous materials during exploration and production drilling, storage and use of petroleum and other hazardous materials at facilities, increased traffic on local roads by construction and well field workers' personal vehicles, increased risk of aircraft accident potential, and other risks inherent in industrial facilities.

When an activity on a lease is proposed, the lessee is required to address the specific hazardous materials that may be brought onto the site during the operation. Due to the variability of the types of activities in terms of exploration, development, and utilization, it is not reasonable to attempt to address all the chemicals or hazardous materials that could be part of the activity. Therefore, the analysis to address the handling and mitigation associated with these materials will be addressed at the activity stage.

4.13.4 Impacts by Alternative

Alternative 1

Under this alternative, there would be no additional threats to human health and safety as a result of geothermal leasing.

Alternatives 2 and 3

Under either of the action alternatives, there would be the potential for threats to human health and safety through the use of hazardous materials during exploratory and development drilling and operations, and construction equipment (including increased traffic on SR-86). While the RFD estimates more BLM land leased under Alternative 3, the same number of wells, roads, and power plants would be needed to develop an economically viable field. Therefore, impacts to human health and safety would be the same under either alternative.

BLM management of hazardous materials would be the same for either Alternative 2 or 3. Mitigation measures for hazardous materials generated by geothermal exploration and development would be specified in authorized use permits, and the responsible party would be required to take corrective action(s) to comply with Federal, State, and local regulations.

Road construction under Alternatives 2 and 3 would make access to more areas easier for those who may illegally dump wastes or illegally target shoot.

Two inactive defense sites could present a public danger from unexploded ordinance, both to workers implementing geothermal exploration and production and to the public who would have greater access to the land due to the additional roads required for geothermal development.

Under Alternative 2, two of the BLM parcels that would be offered for noncompetitive leasing would be within the Navy's Range Safety Zone (RSZ) C. Under Alternative 3, 11 of the BLM parcels that would be offered for noncompetitive leasing would be within the Navy's RSZ C. As stated in the MOU (U.S. Navy 1997), this RSZ exists to provide an adequate area of protected space in which military training operations could be conducted without interference from general aviation traffic. Regardless of which action alternative is implemented, any new structures such as transmission lines, power plants, or energy generation facilities would be not be allowed to exceed the height limitation unless it has been coordinated with the Naval Air Facility El Centro (NAFEC) commanding officer. Prior to issuance of a lease, the BLM would afford the NAFEC commanding officer two weeks to review the lease authorizations. Appropriate height and use warnings and stipulations would be included in the lease and confirmed with the operators prior to lease issuance.

Overhead power lines and the power plants could cause a significant flight safety impact if not mitigated. BLM would coordinate with the Navy in accordance with the MOU to

require the installation of warning balls and/or warning lights for flight safety based upon recommendations or requirements from the Navy.

After any leases have been issued, the commanding officer of NAFEC may notify BLM of any observed noncompliance or unsafe or emergency situation that may require BLM to shut down or restrict operations.

4.14 Energy and Minerals

4.14.1 Management

The CDCA Plan states that a goal includes the identification of potential sites for development of geothermal, wind and solar technology, and power plants, and that the general goals for Geology-Energy-Minerals (G-E-M) resources are to:

(1) Within the multiple-use management framework, assure the availability of known mineral resource lands for exploration and development.

(2) Encourage the development of mineral resources in a manner which satisfies national and local needs and provides for economically and environmentally sound exploration, extraction, and reclamation processes.

(3) Develop a mineral resource inventory, G-E-M database, and professional, technical, and managerial staff knowledgeable in mineral exploration and development.

4.14.2 Impact Criteria

The potential risk of these indirect impacts affecting minerals is assessed with respect to one criterion. Potential impacts on these resources could occur if reasonably foreseeable future actions were to:

- Reduce or prevent exploration or recovery of important economic mineral resources.

The potential risk of indirect impacts affecting minerals from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High: If there were significant impacts on the above criteria;
- Medium: If there were moderate impacts on the above criteria; and
- Low: If there were minor or no impacts on the above criteria.

4.14.3 Impacts by Alternative

Alternative 1

If land is not leased or developed, no new geothermal energy would be produced, and the production of 50 MW (net) of electricity at Truckhaven would not occur. By not leasing and developing the land, no new geothermal energy would be explored or recovered. This would be counter to the goals identified in the CDCA Plan and Imperial County Plan. While mining for sand and gravel has occurred in the past, there are no currently open mines. Potential exists for future interest in sand and gravel, especially in the sand dune area in the southern half of the Truckhaven area. Under Alternative 1, there would be no surface encumbrances from geothermal facilities, which would allow easier access to sand and gravel resources.

Alternatives 2 and 3

Leasing land for geothermal resources would help achieve the goals in the CDCA Plan and Imperial County Plan of promoting energy where appropriate. Under both action alternatives, the same amount of energy would be produced. Under Alternative 2, only 7,051 acres of BLM land would be leased, with the remaining approximately 7,000 acres developed on adjacent State and private property. It is assumed that it would be necessary to develop a minimum of 14,000 acres to produce enough geothermal resources for an economically viable project.

Under Alternative 2, fewer BLM acres would be developed, which would allow more land to be available for future sand and gravel sales.

Oil and gas production is not anticipated within the potential lease area, but oil and gas exploration activity has occurred in the past. Given the limited potential for fluid minerals development, implementation of Alternatives 2 and 3 would not make less high potential land available for that purpose.

No known solid mineral production has occurred in the proposed action area, and no Surface Mining and Reclamation Act classification has occurred in Imperial County (CDC 2001). Metals mining is not anticipated in the geologically young fluvial, deltaic, or lacustrine sediments found within the potential lease area. Therefore, Alternatives 2 and 3 would have a negligible effect on solid minerals leasing. Mining for sand and gravel could occur within the potential lease area because sand dunes are located in the southern half of the area. Therefore, Alternatives 2 and 3 would have a negligible adverse impact on mining for sand and gravel.

4.15 Recreation

4.15.1 Management Goals

The CDCA Plan provides overall management direction for all public lands in the CDCA. The CDCA Plan's Recreation Element lists the following goals:

- Provide for a wide range of quality recreation opportunities and experiences emphasizing dispersed undeveloped use.
- Provide minimum use recreation facilities. Those facilities should emphasize resource protection and visitor safety.
- Manage recreation use to minimize user conflicts, provide a safe recreation environment, and protect desert resources.
- Emphasize the use of public information and education techniques to increase public awareness, enjoyment, and sensitivity to desert resources.
- Adjust management approach to accommodate changing visitor use patterns and preferences.
- Encourage the use and enjoyment of desert recreation opportunities by special populations, and provide facilities to meet the needs of those groups (USDI BLM 1999).

4.15.2 Impact Criteria

The potential risk of these indirect impacts affecting recreation is assessed with respect to two criteria. Potential impacts to recreation could occur if reasonably foreseeable future actions were to:

- Increase the use of neighborhood and regional parks or other recreational facilities such that the facility would substantially deteriorate or that deterioration would be accelerated; or
- Diminish the enjoyment of existing recreational opportunities.

The potential risk of indirect impacts affecting recreation from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High: If there were significant impacts on the above criteria;
- Medium: If there were moderate impacts on the above criteria; and
- Low: If there were minor or no impacts on the above criteria.

4.15.3 General Impacts

This section describes the typical impacts to recreational resources and programs expected as a result of development outlined in the RFD scenario. The potential risk of these indirect impacts affecting recreation and recreational resources is assessed with respect to the goals of the Recreation Element of the CDCA Plan outlined above.

In general, geothermal energy exploration, development, and operations would result in a temporary reduction in the amount of land available for recreational use and in the diminishment of users' recreational experiences on lands that remain open for recreation. Visual impacts, intermittent noise associated with construction, and the temporary loss of access for recreational use would result in a low risk of a significant and temporary effect on the recreational experiences available at the OWSVRA.

The construction of pipelines, wells, storage yards, staging areas, power plants, transmission lines, and roads used by heavy equipment would temporarily limit the amount of land recreational users can use for hiking, wildlife viewing, camping, and OHV riding. During certain phases of construction (i.e., pipeline construction), access via designated trails near construction activity such as trenching would result in the need to use alternative routes for short periods of time. Information concerning temporary trail or route closures would help reduce conflicts with recreational users by directing them to areas unaffected during these construction periods.

Most vehicles gain access to the OWSVRA through a variety of OHV routes accessible via SR-78. Geothermal development in the area would not significantly restrict or reduce access to the OWSVRA for OHV use during construction and operation of geothermal wells proposed for the project. Initial geothermal development, as described in Section 2.2, would involve exploration and subsurface investigations. It is anticipated that in the early stages of the geothermal development at Truckhaven, two or three wells would be drilled. For three wells, as shown in Table 2-2, total surface disturbance would be approximately 19.4 acres. Another 77.9 acres would be disturbed in the second year. Development would continue intermittently for several years until the field is fully developed.

Approximately 33,465 acres of the 40,320 acres within Truckhaven Geothermal Leasing Area are within outer boundaries of the OWSVRA. According to the RFD scenario, however, up to 405 acres would be committed long-term for geothermal development. This represents 1 percent of the total area within the Truckhaven Geothermal Leasing Area. Potential conflicts with OHV users would be minimized to the greatest extent possible during exploration, development, and operations. Geothermal well locations would be placed away from Western Colorado Route of Travel -designated trails to minimize potential conflicts with OHV users and their vehicles.

4.15.4 Impacts by Alternative

Alternative 1

Under Alternative 1, no changes would occur in intensity to current recreational uses. The BLM parcels would not be offered for competitive or noncompetitive leasing for geothermal development. The BLM parcels would remain unchanged, and public access would not be restricted. The CDCA Plan goals relating to recreational uses would not be affected. No impacts to recreational uses would result from implementation of the No Action Alternative.

Alternative 2

Under Alternative 2, the BLM would offer 11 land sections for 7,051 total acres for noncompetitive leasing. Only parcels for which BLM has noncompetitive lease applications would be leased under this alternative.

As shown in Figure 3-6, the proposed lease parcels under this alternative are within the OWSVRA. Alternative 2 could initially restrict public access to small portions of the 7,051 acres of public land offered for noncompetitive leasing that were previously accessible to the public during geothermal exploration; however, this would be a short-term impact as geothermal exploration would last intermittently over a span of 6 to 18 months. Maximum ground disturbance for Alternative 2 would initially be 85 acres of public lands, or about 0.21 percent of the total Truckhaven Geothermal Leasing Area. Ultimately, the surface disturbance would include 69 acres after reclamation of the land disturbed during initial development.

The RFD calls for up to 50 production and injection wells as part of full field development. The well pads, pipelines, roads, and power plants would require a long-term commitment of up to 405 acres of BLM, State, and private land, which would be unavailable for other uses, such as recreation, for the life of the project.

Recreational activities could be disrupted through the physical restriction of recreational areas and OHV trails; the blocking of facility entrances by construction activities and equipment; interference during the construction of pipelines, power lines, and power production facilities; and disruption of the user's enjoyment of the recreational experience. Recreational resources at the OWSVRA are valued for the opportunity for participating in outdoor recreation activities in a natural, scenic setting. Noise, vibration, dust, visual impacts, and odor from construction activities could disrupt users' enjoyment of the area. Similarly, views of construction equipment or the addition or change of industrial structures such as pipelines, power lines, and power production facilities conflict with the natural background of many of these recreational resources and could also disrupt the individual's enjoyment and recreational activities, which could lead to a minor to moderate, long-term aesthetic impact.

While well locations are not yet determined, well sites and infrastructure would be located away from designated trails to the maximum extent possible. It is possible that some existing trail segments may need to be re-routed to accommodate geothermal energy infrastructure. Since cross country travel is not permitted on BLM lands with the Truckhaven Geothermal Leasing Area, only designated trails would be potentially affected.

Conflicts with recreational users could occur when construction vehicles are either traveling to and from construction sites. Construction vehicles would be parked off-trail in designated vehicle staging areas to minimize any temporary loss of access that would occur during construction. The siting of construction and operations away from designated trails would be designed to minimize conflicts with other users of public

lands, thereby minimizing the impacts that construction and operation of well sites would have on recreational resources.

In the event that construction equipment illegally leaves designated access roads, recreational activities may be adversely affected. However, with the inclusion of the best management practices addressed in Chapter 2, impacts to recreation would be mitigated. It is not expected that any designated recreational trails or facilities would be lost as a result of the proposed action.

Alternative 3

Under this alternative, BLM would issue or offer leases for all of its mineral interests within the 40,320 acre Truckhaven Geothermal Leasing Area. Given the assumptions under the RFD, initial ground disturbance would total of 502 acres across the entire area. After reclamation, this would be reduced to 405 acres. Impacts to recreation could occur during exploration, development, and operations and would be similar to those described under Alternative 2. While it is impossible to identify where development would occur, the nature of geothermal energy development allows its infrastructure to be sited away from other resources if necessary.

Impacts to recreation, however, would persist even if no trails or other facilities are lost to geothermal energy development. As with Alternative 2, some users would be adversely affected by the changed viewshed with its above-ground pipelines, drilling rigs, wells, transmission and distribution power lines, and power plants.

Recreational Impacts Common to Alternatives 2 and 3

Since some OHV trails may not be clearly marked, it may be possible that some users would leave official routes and suddenly come upon these structures, possibly resulting in injuries. Appropriate signage placed to alert recreational users of the presence of well sites and infrastructure would reduce the potential for conflicts. Additionally, the well sites and infrastructure would be located to minimize conflicts with designated OHV trails.

While it is not likely, some undesignated trails may be permanently closed to OHV use; closure of these undesignated trails could redirect the ever-increasing numbers of users onto fewer miles of designated trails. This would not only diminish their recreational experience, it could potentially increase collisions, causing serious injuries or even deaths. However, this is speculative because the amount of drilling and well siting has not been finalized. Additionally, the closure of illegal, undesignated trails would not be considered a significant impact, as usage of such undesignated trails is in conflict with California Department of Parks and Recreation policies governing OHV usage.

As shown in Figure 3-6, 22 of these lease parcels are within the OWSVRA. Alternative 3 could initially restrict public access to small portions of the 14,731 acres of public land offered for noncompetitive leasing that were previously accessible to the public during

geothermal exploration; however, this would be a short-term impact as geothermal exploration would last intermittently over a span of six to eight months. Maximum ground disturbance of BLM land for Alternative 3 would initially be 183 acres, or around 0.45 percent of the total Truckhaven Geothermal Leasing Area (40,320 acres). After construction, reclamation would reduce the surface disturbance to 148 acres, or 0.37 percent of the total land within the project area.

All geothermal energy-related infrastructure would constitute a long-term loss of up to 405 acres of land, or approximately 1 percent of the total Truckhaven Geothermal Leasing Area (BLM, State, and private). This land would be unavailable for other uses such as recreation for the life of the project.

Impacts to recreation under Alternative 3 would be similar to those of Alternative 2. However, under Alternative 3 impacts would occur only on Federal land. Additionally, although the amount of land lost within the Truckhaven Geothermal Leasing Area would be greater than that under Alternative 2, the inclusion of the BMPs and mitigation measures identified in Chapter 2 would result in a low impact to recreational resources.

There would be a minor to moderate impact to recreation under either action alternative. Some visual and noise impacts would occur and there may be temporary short term loss of some trail segments. While unlikely, it is possible that some trail segments would be closed and re-routed. It is not expected that the total number of trails or mileage would be lost as a result of leasing and development of geothermal energy

4.16 Special Areas

4.16.1 Management Goals

Because of their special status, wilderness areas have strict guidelines for development in or around them. These guidelines prohibit activities that degrade the quality, character, and integrity of these protected lands. Developments proposed near wilderness areas must follow the guidance contained in various regulations and BLM manuals and handbooks (43 CFR 6300; H-8560-1 (USDI BLM 1988); Manual Section 8560 (USDI BLM 1993); H-8550-1 (USDI BLM 1995); and H-6310-1 (USDI BLM 2001)).

BLM has set goals for wilderness areas in this region. The wilderness goals aim to accomplish three major objectives:

- Provide protection of wilderness values so those values are not degraded to a point that significantly constrains the recommendation with respect to an area's suitability or non-suitability for preservation as wilderness.
- Provide a wilderness system possessing a variety of opportunities for primitive and unconfined types of recreation, involving a diversity of ecosystems and landforms, geographically distributed throughout the desert.

- Manage a wilderness system in an unimpaired state, preserving wilderness values and primitive recreation opportunities while providing for acceptable use.

4.16.2 Impact Criteria

Impacts are analyzed in the context of the degree to which they have:

- A substantial adverse effect on a scenic vista;
- Substantial damage to scenic resources, including but not limited to trees and rock outcroppings;
- Substantial degradation to the existing visual character or quality of the surrounding area; or
- Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

4.16.3 General Impacts

Because wilderness consists of functioning ecosystems and natural processes, effects on wilderness are based largely on the effects analysis of the relevant resources addressed elsewhere in this Final EIS. Development of geothermal resources could negatively affect nearby wilderness areas in the following ways:

- Visual impacts from steam dissipating into the atmosphere;
- Air pollution in the form of noxious fumes containing H_2S, causing a "rotten-egg" smell; and
- Solid waste from energy production.

4.16.4 Impacts by Alternative

The following sections detail the expected effects of the three alternatives on special areas. These effects may vary depending on the total area available for leasing.

Alternative 1

Under Alternative 1, the BLM would not offer any lands for geothermal leasing. There would be no impacts to the Fish Creek Mountains Wilderness Area.

Alternatives 2 and 3

Under Alternative 2, the BLM would offer 11 sections (7,051 acres) of land for noncompetitive leasing. Only tracts for which BLM currently has noncompetitive lease applications would be offered under this alternative.

Because of the expansive size and undulating nature of the nearby wilderness area, combined with the limited dispersal of geothermal facilities, this alternative would not detract from the user's solitude and perception of natural conditions and wilderness in the Fish Creek Mountains Wilderness Area. The effects on visual aesthetics of this wilderness area are expected to range from negligible to minor because of its distance from Truckhaven.

Under Alternative 3, BLM would issue leases for tracts with existing noncompetitive leasing applications and would offer competitive leases for all other lands at Truckhaven, totaling 14,731 acres. These leases would be issued with standard resource protection stipulations.

4.17 Social and Economic Conditions

4.17.1 Management Goals

There are no management goals for social or economic conditions or environmental justice from existing land use plans for the area. The policies discussed in Chapter 1 provide the direction for the program as it relates to the proposed action.

4.17.2 Impact Criteria

The potential risk of indirect impacts affecting socioeconomics and environmental justice is assessed with respect to eight criteria. Potential impacts to socioeconomics and environmental justice could occur if reasonably foreseeable future actions were to:

- Affect expenditures or income within the study area associated with the project;
- Induce growth or population concentrations;
- Displace a proportion of residences in a community;
- Create a demand for additional housing that could not be sustained within the study area;
- Cause a decrease in local or study area employment;
- Displace or disrupt businesses;
- Generate student enrollment that exceeds the school district's capability to accommodate them;
- Cause a disproportionately high and adverse impact on minority or low-income populations; or

- Create perceptions of threats or opportunities affecting lifestyles, beliefs, and values about the quality of life in adjacent communities.

The potential risk of indirect impacts affecting socioeconomics and environmental justice from exploration, development, production, or closeout uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing the potential risk of future indirect impacts from the proposed action:

- High: If there were significant impacts on the above criteria;
- Medium: If there were moderate impacts on the above criteria; and
- Low: If there were minor or no impacts on the above criteria.

4.17.3 General Impacts

Local socioeconomic impacts would arise primarily from the construction and operation of a power plant built to develop the geothermal resource of the lease tracts. Construction and operation of the plant would create new jobs and produce new local expenditures that would in turn generate secondary economic impacts in the form of more jobs and income, increased public revenue, and perhaps increased local population. Population growth could then impact community infrastructure—housing, schools, domestic water systems, etc.—and social well-being. In the context of the broader regional and national energy economy, the development of the Truckhaven Geothermal Leasing Area would yield benefits such as zero emission-based heat and power and avoidance of many of the external social costs associated with power produced from fossil fuels.

Socioeconomic impacts would be felt in Imperial County and in the Coachella Valley of Riverside County. The sizable populations of these areas are less than an hour commute from the Truckhaven area. Construction workers would come from either area or, if commuting from outside the region, would temporarily reside in either area. Permanent operations and maintenance workers would reside in either area. Similarly, local project expenditures for fuel, housing, transportation, and supplies needed for exploration, development, and operation could occur in either area.

Because the geothermal facility would be located in Imperial County, most of the public revenue benefits would be received by jurisdictions within Imperial County. The County is the taxing authority and would receive all of the property tax and the better part of the sales tax associated with the project. Additionally, the County would be the recipient of 25 percent of the Federal royalties. Some portion of the increased sales tax revenues would accrue to Riverside County from the purchase of goods and services related to workers traveling to the County from the geothermal project area.

Potential social impacts associated with a geothermal facility are most likely to result from local perceptions about threats and opportunities affecting lifestyles and evaluations of community quality of life (Freudenburg et al. 1994; Leistritz et al. 1981). Such perceptions are often based on the assessment of facility characteristics and their potential

for risk or benefit to families and individuals in adjacent communities (Slovic et al. 1991; Edelstein 2004). Geothermal facilities already exist within the project area and residents have some familiarity with geothermal power generation. It is unlikely that an additional facility would result in perceptions of threat to health or quality of life, changes in activity patterns, or substantial changes in the values and beliefs about the quality of place in this social environment. It is more likely that residents in adjacent communities will perceive such a facility as acceptable because it may generate employment, taxes, and it will "fit" with other existing rural industrial facilities.

The influence on recreation and the aesthetic characteristics of a facility also have the potential to affect the quality of life in adjacent communities. The potential for influences on OHV recreation are discussed in more detail below in the discussion of Alternative 3. Similarly, the potential for influences on the overall aesthetic environment that contributes to community quality of life is discussed in Sections 3.11.2 and 4.11.4. These discussions suggest the potential for limited impacts on the aesthetic components of the community's quality of life.

Impacts of Alternative 1

Under the No Action Alternative, BLM would not offer any lands for geothermal leasing. There would be no socioeconomic impacts from geothermal energy development.

Impacts of Alternative 2

Under this alternative, BLM would offer for lease only tracts for which it currently has noncompetitive lease applications. Eleven sections of land with pending geothermal lease applications for non-competitive leasing (7,051 acres) would be approved. However, the development level described in the RFD scenario would still occur since this document assumes any shortfall in Federal leased acreage would be made up from private or State lease holdings.

With one exception, socioeconomic impacts under this alternative would be the same as those under the Proposed Action because the development level – the RFD scenario – would be the same. The exception would be the amount of Federal mineral royalties generated. Since the Federal acreage would be halved, the estimated Federal royalties would be halved. Royalties on the non-Federal leases involved in the development would still be paid, but the recipients would be the other owners of geothermal rights: individuals or the State of California.

Impacts of Alternative 3

Reasonable Foreseeable Development

The proposed action is to lease 14,731 acres of public land for development of geothermal resources. Because the BLM tracts have not been leased, BLM has no leaseholder's Plan of Development with details of facility construction and operation.

For that reason, BLM has created an RFD scenario. The RFD scenario represents BLM's best estimate of the scale of development that would occur if the Truckhaven tracts were to be leased (see Section 2.2). For the socioeconomic analysis, the most important element of the RFD is the provision for a power plant (or plants) that would produce 50 MW of electricity.

Employment and Income

A 2005 survey of companies engaged in geothermal activities was conducted to assess and characterize the current workforce involved in geothermal activities in the U.S. (Hance 2005). The survey established that construction of geothermal electrical power plants requires 37.4 person months per megawatt. The survey included drilling and power line installation as part of construction. Operations and maintenance of such plants requires on average 1.7 person years per megawatt annually. These employment figures are in agreement with other assessments of geothermal energy industry employment (USDOE 2004).

Using these average rates to calculate the employment needs of a Truckhaven geothermal power plant with 50-MW (net) capacity results in 1,870 person months for construction and drilling. Typically, a construction project begins slowly and peaks later in the process. Assuming a 36-month construction period, average employment at any one time would be 52 employees, but a likely peak employment would be 125 employees. The industry average rate for operations and maintenance yields an estimated 85 person-years annually for operation of the plant (i.e., the plant would require 85 permanent jobs).

The RFD scenario does not include any estimate of expenditures for plant construction or operation. However, the certification application for the Salton Sea Unit #6 power plant does have such information. The Final Staff Assessment of the California Energy Commission on an Application for Certification of the Salton Sea Unit #6 describes expenditures for that 185-MW facility (CEC 2003). Adjusting that facility's published figures for the difference in scale (185 MW versus 50 MW) produces estimates of a Truckhaven power plant's expenditures. The total estimated Truckhaven project cost would be $135 million. Local expenditures for construction would be $30 million, and local expenditures for operation would be $5 million. The construction payroll would be $9 million. The operations payroll was estimated independently at $3.2 million annually.

The assessment of the Salton Sea Unit #6 used the input-output economic model *Impact Analysis for Planning* (IMPLAN) to estimate secondary employment impacts of the project. The model used multipliers that allowed calculation of the secondary impacts of the project. The multiplier used for construction employment was 3.1, meaning that for every project construction job an additional 2.1 jobs were needed in the economy to sustain the project activity. The operations employment multiplier was 2.5. An income multiplier of 1.6 was used for both construction and operations income.

Using the same multipliers for the Truckhaven power plant produces secondary employment of 263 for construction and 128 for operations (Table 4-9). Secondary

income would be an additional $5.4 million annually for construction and $1.9 million annually for operations. The multipliers used estimate secondary impacts on a region-wide basis, not a local basis. Only some of the secondary employment and income induced by the project, depending on the particular economic sector, would occur locally. The remainder would be dispersed throughout Southern California or an even wider region.

Table 4-9 Selected Socioeconomic Impacts

	Direct	Secondary	Percent of Current
Construction (Total)			
Employment (workers – peak, not total)	125	263	< 0.1
Income (million)	$9.0	$5.4	< 0.1
Expenditures (million)	$30.0	NA	NA
Operations (annual)			
Employment (workers)	85	128	< 0.1
Income (million)	$3.2	$1.9	< 0.1
Expenditure (million)	$5.0	NA	NA
New population	160	NA	< 0.3
Public Revenue (Annual)			
Assessed valuation (million)	$77.8	NA	0.9
Property tax (000)	$894.3	NA	0.9
Sales tax Construction (total) (million)	$2.5	NA	NA
Sales tax Operations (000)	$438.9	NA	NA
Federal royalty (000) – County	$377.5	NA	NA
Federal royalty (000) – State	$755.0	NA	<1.0
Demographic Impact			
Population change (workers and families)	94–160	NA	< 0.1

Recreation

Individuals and groups who recreate on public lands in the Truckhaven area would be negatively affected if lease development were to result in closures to OHV use. Reducing the amount of area available for OHVs would increase crowding elsewhere and diminish the recreation experience. In addition, introduction of industrial features into the landscape at sufficient scale could alter the setting, and thus the recreation experience for some people. Either result would constitute an adverse socioeconomic impact. Most likely, however, recreation activities would only be disrupted for a short time, and the scale of the industrial features would not be great enough to alter the experience. Any

impacts would be transitory and very limited. See Section 4.15 (Recreation) for more detail.

Public Revenue

Holders of geothermal leases on public lands are subject to royalty payments of up to 5 percent of the gross proceeds of electrical sales. Without more detailed information on the structure of the market that a Truckhaven facility would sell to and an assumption on long-term electric prices, gross proceeds cannot be projected and royalties cannot be calculated. The Energy Policy Act of 2005 requires geothermal royalties to be distributed according to the following schedule: 25 percent to the Federal Treasury, 50 percent to the state where the royalties were generated, and 25 percent to the county of origin. The county of origin additionally receives 40 percent of the State's share (Glassley 2007).

There are no data available for Imperial County, but a recent study done for Siskiyou County estimates an annual $1.51 million royalty (adjusted for inflation) for a 50-MW (net) power production called for in the RFD scenario. Imperial County's annual share of the $1.51 million would be a direct payment from the Federal government of $377,500 and an indirect receipt from the State of California of $302,000, totaling $679,500, or 45 percent of the total. The Federal Treasury's share would amount to $377,500 and the State of California would net $453,000 after its disbursement to Imperial County.

Currently, geothermal power plants are an important part of Imperial County's property tax base. A 50-MW (net) plant could add $77.8 million to that base, generating $894,300 annually in property tax revenue. This would amount to 0.9 percent of Imperial County's 2004 property tax revenue. The new jobs created by the project and the expenditures for equipment, materials, and supplies would all produce sales tax revenues locally. During construction, an estimated $2.5 million in sales tax revenue would be collected. After operation had begun, an estimated $438,933 would be collected annually. The sales tax revenue would be distributed between the State of California, Imperial County, and Riverside County, depending on the relative amount of expenditures in the Imperial Valley or the Coachella Valley.

Growth Inducing Impacts

Local population could grow as a result of project workers migrating into the area with their families, either temporarily or on a permanent basis. In the case of a Truckhaven power plant, it is unlikely that more than a few construction workers would migrate into the area, even on a temporary basis. Both the Coachella Valley and the Imperial Valley have most of the skills in the local work force required for plant construction. Moreover, the very high unemployment in Imperial County suggests a high local demand for new construction jobs. Workers who do commute to the project area are most likely to do so on a weekly basis and take up temporary housing in motels, rental units, or their own portable housing units. There is ample temporary housing in both the Coachella Valley and the Imperial Valley.

Similarly, a high percentage of new permanent jobs created by the Truckhaven geothermal plant is likely to be filled locally because the skills are available locally and because of the high latent demand for work.

The low probability of plant construction causing workers to migrate into the local area and the low percentage of permanent workers likely to migrate indicate that the proposed project would result in a minimal population impact. If 30 percent of the 85 jobs were to go to migrants, that would amount to 25 workers. Relocation of 25 workers with their families would represent population growth of 94 people. Even if immigration were 50 percent, population growth would be only 160 people. In either case, it would amount to less than one-tenth of 1 percent of the current or anticipated population of the socioeconomic impact area.

Other Socioeconomic Impacts

The relatively small population impact generated by developing the Truckhaven geothermal lease tracts indicates no impact on public infrastructure in the socioeconomic impact area would occur. The needs of the limited number of people that might relocate to the area for housing, schools, social services, and utilities could readily be met by the existing infrastructure.

4.17.4 Environmental Justice

The environmental justice requirement of Executive Order 12898 is described in Section 3.17.2: "Federal agencies identify and address disproportionately high and adverse human health and environmental effects, including the socioeconomic effects of their programs, policies, and activities on minority populations and low-income populations." *Minority populations* in this context are Hispanic, African-American, Native American, Asian, or Pacific Islander populations that either (a) exceed 50 percent in the affected area; or (b) are meaningfully of greater percentage than in the general population. *Low-income populations* are those that exceed the poverty threshold (CEQ 1997).

The Hispanic population of the Truckhaven socioeconomic impact area exceeds 50 percent in Imperial County and its percentage of the population in the Coachella Valley could be construed to be meaningfully greater than the general population of both Riverside County and the State. Additionally, a substantial portion of the Imperial Valley population has income below the poverty level. Therefore, there is potential for identified minority or low-income populations to suffer disproportionately high and adverse human health and environmental effects as a result of the Truckhaven leasing proposal. However, no adverse health and environmental effects have been identified in this EIS. The socioeconomic impacts described above are beneficial and not adverse. The air quality and hazardous materials analyses of this EIS have identified no adverse impacts on human health (see Sections 4.1 and 4.13). Other sections of the EIS document no adverse environmental impacts that would have a high impact on any populations, including those covered by the environmental justice requirements.

The immediate locale of the leasing has been identified as ancestral lands by the San Pasqual Band of Mission Indians. Section 4.9, Cultural Resources, describes the consultation process with this and other groups of Native Americans. When that process has been completed, the manner and degree of impact on Native Americans can be clarified.

4.18 Transportation and Traffic

4.18.1 Management Goals

There are no management goals for transportation and traffic in the CDCA Plan.

4.18.2 Impact Criteria

Impacts to transportation and circulation are assessed with respect to the potential for disruption or improvement of current transportation patterns and systems; deterioration or improvement of existing level of service (LOS); and changes in existing levels of traffic safety. Impacts may arise from physical changes to circulation (e.g., closing, rerouting, or creating roads), construction activity, introduction of construction-related traffic on local roads, or changes in daily or peak-hour traffic volumes created by either direct or indirect workforce and population changes in the area. Impacts on roadway capacities would be significant if roads with no history of capacity exceedences were forced to operate at or above their full design capacity.

The analysis of potential traffic impact was prepared based on the *Highway Capacity Manual* published by the Transportation Research Board of the National Research Council. In addition, the American State Highway and Transportation Officers' *Geometric Design of Highways and Streets* was considered in determining impact significance. Since there is not a project-level design beyond the RFD scenario, a basic analysis was performed that would provide some idea of the traffic that would be generated by the project.

4.18.3 General Impacts

Traffic impacts would be caused by increased vehicle access to the area related to project exploration, development (construction), and operations. While it is difficult to exactly define how many more vehicles would use local and trunk roads, it is possible to use the assumptions outlined in Section 4.18.3 and the scale of development expected at Truckhaven discussed in the RFD scenario in Section 2.2.

The amount of vehicular traffic would be directly proportional to the number of vehicles that would be related to exploration, construction, and operations. Initial exploration includes drilling 2 or 3 deep wells on an equal number of pads. Drilling would last 60 days for a total of 120 to 180 days to drill the wells. This phase would last six months and would require one crew operating the drilling rig. Each well would require about 30 tractor trailer trips to haul in the rig, drilling pipe, water tanks, and other drilling equipment. In addition, drilling activities would require a crew of workers generating 10

passenger vehicle trips per day, as well as an estimated four vehicle trips from medium-sized trucks delivering equipment and water.

Construction of the power plant facilities would last for a period of four months per facility. It is assumed that construction of the two power plant facilities outlined in the RFD scenario would result in 200 passenger vehicle and light truck trips per site daily while construction is ongoing, for a total of 400 vehicle trips per day, assuming both are constructed simultaneously. Once the project has been completed, it is estimated the operation of the facilities outlined in the RFD scenario would result up to 85 worker trips daily while the plant is in operation. There would also be an undetermined number of visitor and contractor trips per day. Based on the LOS of the roadways that would provide access to Truckhaven, the increases of vehicular traffic due to well development activities would not significantly affect the LOS.

Table 4-10 shows the projected future short- and long-term impacts to traffic from the construction and operation phases of a geothermal plant for the three project alternatives. At this time, it cannot be predicted where in the Truckhaven area the exploration and development of the power plant would occur; therefore, this traffic cannot be assigned to a particular road until such a determination has been made.

Given that construction workers and equipment would access the project sites by SR-86 from either Interstate 8 or 10 (the later also via SR-111), increases would by minor. For example, the average number of vehicles using SR-86 from the junction of SR-78 to Air Park Drive is 10,400 with a peak volume of 1050 vehicles (see Table 3-11). As Table 4-10 illustrates, traffic would increase by 14 POVs and light to medium trucks per day per well. An additional 30 tractor trailer trips would supply equipment for each well over several days. Even by including the tractor trailer trips, this represents an increase of around 4 percent at peak times, or 0.4 percent to the daily volume.

4.18.4 Impacts by Alternative

Alternative 1

Under the No Action Alternative, the BLM would not lease any parcels for geothermal exploration and development. There would not be an introduction of additional vehicles onto the local roadway system. Impacts to LOS on local roads and at local intersections would not occur. No impacts to traffic would occur.

Table 4-10 Total Generated Traffic During Development Phases

	Daily Vehicle Trips by Type	Time Frame	Total Vehicle Trips by Phase
Initial phase – 60–90 days per well	10 POV	60–90 days per well	600–900
	4 light or medium trucks	60–90 days per well	240–360
	Tractor trailers	30 trips per well times 3 wells	270
	Total vehicle trips for initial phase		**1,110–1,530**
Development/ construction of wells	10 POV	60–90 days per well times 47 wells	28,200–42,300
	4 light or medium trucks	60 days per well times 47 wells	11,280–16,920
	Tractor trailers	30 trips per well times 47 wells	1,410
	Total vehicle trips for development phase		**40,890–60,630**
Construction of power plants	200 POV or light to medium trucks	120 days per plant	24,000
	Total vehicle trips for power plant phase		**48,000**
Total vehicle trips all phases			**66,000–110,160**

Key: POV = Personally owned vehicle.

Alternative 2

Under Alternative 2, the BLM would lease 11 parcels (7,051 acres) for geothermal exploration and development. Typical traffic related to geothermal exploration and development is described in Section 4.18.4. Detailed construction plans are not yet available, although vehicles would likely access the project area from the north and south of the Truckhaven area via S-22 and SR-78. Although initial geothermal exploration and development would result in the addition of up to 14 vehicle trips per day onto local roadways for a three-month period, the LOS for S-22 and SR-78 would not decrease based on assumptions contained in the *Highway Capacity Manual 2000*. Full field development and power plant construction traffic would comprise 41,000 to 60,630 vehicle trips spread out over 7.75 to 11.5 years represents a small portion of the total existing traffic. Further, increases in traffic volume associated with drilling and construction activity would be temporary; upon completion of construction, no long-term impacts to the local roadways would occur. Existing dirt roads within the OWSVRA would need to be improved to accommodate construction vehicles accessing well sites on BLM parcels. At this time, road improvements or access routes have not been determined. The mitigation measures outlined in Section 2.1.6 would be considered during implementation.

Alternative 3

Under Alternative 3, the BLM would lease 22½ parcels (14,731 acres) for geothermal exploration and development. Section 4.18.4 discusses typical traffic related to geothermal exploration and development. As with Alternative 2, detailed construction plans are not yet available, although vehicles would likely access the project area from the north and south of the Truckhaven area via S-22 and SR-78. Existing dirt roads within the OWSVRA would need to be improved to accommodate construction vehicles accessing well sites on BLM parcels. At this time, road improvements or access routes have not been determined. Drilling and power plant construction traffic would comprise only a small portion of the total existing traffic. Furthermore, increases in traffic volume associated with drilling and construction activity would be temporary; upon completion of construction, no long-term impacts to the local roadways would occur. The measures outlined above for traffic control that would be implemented for Alternative 2 would also be implemented for Alternative 3. These measures would minimize the likelihood that traffic safety issues would develop. Since the same amount of development would be spread over twice as much land area under Alternative 3 as there would be under Alternative 2, the impact to local roadways would be less since traffic would be distributed over a larger area.

Growth Inducing Impacts

It is not expected that geothermal exploration, development or operation would require construction of new permanent trunk roads. The existing road infrastructure would satisfy the increased number of workers' vehicles that would be used to develop and operate any geothermal energy production at Truckhaven.

4.19 Cumulative Impacts

4.19.1 Introduction

The Final EIS also addresses the potential cumulative impacts required by the CEQ regulations. Cumulative impacts are defined as follows:

> 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).

Cumulative impacts include impacts occurring on resources or lands both within and outside the planning area and/or outside of BLM jurisdiction as a result of BLM management actions taking place within the planning area. The time frame for the cumulative impacts analysis begins when the alternative action(s) take effect and extends up to 40 years.

CEQ regulations state that the cumulative impact analysis should include anticipated environmental impacts resulting from:

> …the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time (40 CFR 1508.7).

Impacts of the proposed action and alternatives presented in this Final EIS are assessed for cumulative impacts with other past, present, and reasonably foreseeable future actions in the region. Unless otherwise specified, the region of influence for each resource in the cumulative analysis is the same as the area defined in Chapter 3.

This analysis considers the action alternatives' effects (including the proposed action), as evaluated in detail in Chapter 4, when combined with the effects of other past, present, and future actions in the affected region. Since the proposed action is to only issue leases, and leasing in and of itself does not cause any direct impact as defined by the CEQ regulations, no direct impacts would occur that would contribute to cumulative conditions in the affected area. Cumulative actions evaluated in this section include subsequent geothermal development actions described in the RFD scenario, other proposed land actions and use of those lands, and other reasonably foreseeable future actions.

As previously noted, a cumulative impact assessment must identify the past, present, and reasonably foreseeable future actions and impacts on the affected landscape. In Imperial County and the Truckhaven area in particular, these activities include agricultural development, recreation use, roads, military bases, utility corridors, residential development, state minerals and energy development. All of these activities affect similar elements of the environment in that they may remove surface vegetation, reduce native species and habitat, introduce invasive species, cause sedimentation to surface water bodies, introduce hazardous materials, and impact traffic patterns.

4.19.2 Other Relevant Projects and Activities that May Contribute to Cumulative Impacts

Potential geothermal leasing and development in the Truckhaven area may have an adverse cumulative effect on one or more elements of the environment when combined with other activities in the region. Two significant proposals currently being considered within the analysis area are the Sunrise Powerlink transmission line and geothermal leasing at the U.S. Navy's Superstition Mountain training ground southeast of Truckhaven.

Sunrise Powerlink Project Description

This project, proposed by San Diego Gas and Electric (SDG&E), would construct a 150-mile electric transmission line between the Imperial Valley and San Diego County.

The Sunrise Powerlink project's stated purpose is to transmit clean and renewable energy such as wind, solar and geothermal from the Valley to the approximately 2.5 million customers in the San Diego metropolitan area. None of the proposed corridors traverse the Truckhaven Geothermal Leasing Area or the OWSVRA. One part of the project known as the Desert Link section would construct a 500-kV line south of Truckhaven along SR-78 to provide a means to carry electricity generated there to market. Currently, this project has not been approved by the California Public Utilities Commission (CPUC), nor has its exact path been determined.

Desert Link

The Desert Link section encompasses the 500-kV line from the existing Imperial Valley Substation to the western Anza-Borrego Desert State Park (ABDSP) boundary. The Desert Link is the portion of the project that includes the area within Imperial County and the ABDSP. The BLM and ABDSP have jurisdiction over the majority of land affected by this project.

BLM Portion of Sunrise Powerlink Desert Link Section

A proposed new 500-kV transmission line would begin at the existing Imperial Valley Substation and end at the eastern boundary of the ABDSP, a distance of about 61 miles. The proposed route would traverse open desert in portions and follow existing transmission lines along an existing BLM ROW and dedicated utility corridor. Lattice structures are proposed where the new 500-kV line would require new routing. Additionally, the Imperial Valley Substation would be modified to accommodate the new 500-kV line.

ABDSP Portion of Sunrise Powerlink Desert Link Section

SDG&E has an existing 100-foot ROW through ABDSP, but it would need an additional 50 feet to accommodate the new line. While the majority of the existing easement through ABDSP is 100 feet, there are three ROW segments that total less than one mile in length and 24 feet in width. Although this existing ROW is within the ABDSP, the jurisdiction for the existing 100-foot ROW is with the BLM. SDG&E proposes to remove existing wood power poles and place the new 500-kV line on new structures.

The ABDSP segment would be about 22.6 miles in length. An estimated 26.5 miles of existing transmission lines would be removed along the length of the ABDSP segment. Access roads would be placed within the ROW to minimize further impacts to the area. The total time of construction for the Desert Link segment of the project is estimated to be about 24 months.

The Sunrise Powerlink project is currently before the CPUC for its review and approval. BLM and the CPUC are preparing a joint EIS/Environmental Impact Report (EIR) for this project that will carry renewable energy generated in Imperial County to market in San Diego and other communities in Southern California. The EIS/EIR will also amend

the CDCA Plan because some of the proposed routes for transmission lines will deviate from existing designated utility corridors.

The cumulative effects analysis in SDG&E's proponent's environmental assessment identifies 23 pending or approved projects that may cause related impacts along the proposed route of the line (SDG&E 2006, Table 11.1-1). Truckhaven was not included in that list or in the environmental assessment's analysis.

Green Path Project

IID Energy's Green Path project would carry energy generated from renewable sources produced in Imperial County and elsewhere to customers in Imperial and Riverside Counties. The Green Path Southwest portion of the project would be constructed by IID up to the San Diego County line where it would connect with SDG&E's Sunrise Powerlink project (Rose 2006). Much of the Green Path line would be built on BLM land, but it would not traverse lands at Truckhaven. There are no data for the Green Path project as of the publication date of this EIS.

Naval Air Facility El Centro-Superstition Mountain

Another utility grade geothermal prospect is located 12 miles southeast of Truckhaven at Superstition Mountain. Officially known as the NAFEC Parachute Bombing Range at Superstition Mountain, the property is withdrawn public land managed by the U.S. Navy. As the leasing agent for the Federal government, BLM has received three noncompetitive lease applications for geothermal resources at NAFEC. The Navy, with BLM as a cooperating agency, will consider these applications in a separate NEPA document.

Based on well tests and other data, Superstition Mountain is considered a better prospect than Truckhaven (DOD 2003) in terms of power production potential and temperature of the resource. Given the direct correlation between amount of energy produced and the number of wells, this could result in more wells and hence more surface disturbance to develop Superstition Mountain to its potential. Another source states that the play would be smaller than Truckhaven, amounting to only 20 to 40 MW, which would mean fewer acres disturbed (Layman Energy Associates 2007).

Quantifying impacts for the Superstition Mountain project is speculative at this point, since the Navy has yet to begin its environmental review process. It is possible, however, to discuss how Superstition Mountain and Truckhaven would affect similar elements of the environment. For example, exploration, development, and utilization activities would remove vegetation, expose soils to possible erosion and sedimentation of nearby waterways, increase habitat fragmentation, and potentially displace recreational activities.

Cumulatively, these resources could suffer adverse effects from not only these two geothermal prospects but also from other proposed projects, such as the Sunrise Powerlink, home site and residential developments near Borrego Springs (25 miles west of the Truckhaven area), large-scale water-intensive agriculture, power plants, and many

other small but potentially significant developments in the valley. The vast majority of these activities occur far from the Truckhaven area. From a cumulative impacts standpoint, the most significant issues are habitat fragmentation, water quality, and recreation.

According to the CEQ regulations, the significance of an impact is measured by its context and intensity (40 CFR 1508.27). From a contextual perspective, the overall estimated impact for the proposed development at Truckhaven is limited geographically and in the context of the surrounding landscape. Around 50 percent of Imperial County is considered undeveloped, with the majority of the developed land under agricultural use. The potential removal of initially up to 502 acres of vegetation, with 405 acres remaining cleared during the utilization phase at Truckhaven, would be around 0.00017 percent of the total land in the County. Even in the context of land in the Truckhaven Geothermal Leasing area itself, this represents 1.24 percent of land disturbed. After construction, reclamation would reduce the land affected to 405 acres for a long-term impact (1 percent of all land within the project area).

Intensity of the activities would be minor, although there could be site-specific impacts that would be mitigated. These mitigation measures could include timing and surface use stipulations on the leases and conditions of approval at the time of permitting wells and other infrastructure.

Impact to the regional power grid could also be an issue. The IID, in cooperation with the Imperial Valley Study Group, have been analyzing capacity and voltage stability issues on the existing grid. This effort has been driven by the assumption that future energy developments will outstrip the capacity of the existing infrastructure. One possible solution is the Sunrise Powerlink, which would upgrade existing and build new power transmission lines through the County. It is expected Truckhaven, at 50 MW (net), would be a minor incremental impact on the current transmission capacity. It is not expected that power generated at Truckhaven would be unable to find its way to market because of transmission line issues. Over time, however, other future power generation projects from within and outside of Imperial County could overburden the existing infrastructure.

Leasing of State Lands within Truckhaven Geothermal Leasing Area

The California State Lands Commission (CSLC) has received applications for prospecting permits pursuant to Public Resources Code section 6910, and a nomination pursuant to Public Resources Code section 6911 & 2 C.C.R. § 2249 requesting the Commission to conduct a competitive lease sale, each covering geothermal resources underlying lands within the Truckhaven Geothermal Leasing Area. The CSLC intends to use this document as a programmatic Environmental Impact Report (EIR) under the California Environmental Quality Act (CEQA) for the potential issuance of State leases for geothermal resources on areas where the CSLC has jurisdiction over mineral interests. Any specific exploration or production activities involving surface disturbance proposed in the future would be subject to further review under the CEQA and approval by the

Commission. (Additional resource studies would also be undertaken prior to leasing on State lands, including those regarding special status species and cultural resources.)

4.19.3 Cumulative Impacts by Resource

Air Quality

While geothermal energy generates minimal emissions compared to fossil fuels, the exploration, development, and operation of this renewable resource would be responsible for minor amounts of air pollutants. As noted in Section 4.1, diesel exhaust from construction and drilling equipment and dust from road and well pad construction and use would contribute air pollutants to the region. The analysis in Section 4.1, however, states that any incremental increase in criteria air pollutants and other emissions would remain below *de minimis* levels under the Clean Air Act and would not affect the airshed's attainment status under the Clean Air Act.

There would be a minor increase in visible water vapor from cooling tower plumes in certain cold weather conditions. Visual quality would be adversely affected on the few days on which atmospheric conditions would be favorable for condensation development.

Local air quality is plagued by increased levels of particulates and the 24-hour ozone standards. Currently the Salton Sea Air Basin is in serious or marginal non-attainment status of the National Ambient Air Quality Standards for ozone and PM_{10}, respectively. The region is generally in attainment status for other criteria air pollutants. The Sunrise Powerlink project estimates that air quality would be primarily impacted during construction and would be temporary (SDG&E 2006). PM_{10} emissions from Sunrise Powerlink during construction are estimated at 221.6 pounds per day or 40.442 tons per year. The Truckhaven project by comparison would contribute 7.89 tons (43 pounds per day), 20.75 tons (113 pounds per day), and 5.57 tons (30.52 pounds per day) during the first through third years of project development. It is not known at this time which, if any, of these construction years would overlap. The threshold for particulate matter emissions for the Salton Sea Air Basin is 100 pounds per day, which is exceeded by the Sunrise Powerlink project and by Truckhaven during the second year of development. Cumulatively, the threshold would be exceeded by over 300 percent if Sunrise Powerlink and the second year of Truckhaven were to coincide.

Other sources of particulate matter, such those from agricultural, recreational, and natural sources, are unquantified but are considered the primary causes of dust and particulates in the region.

Combining the potential activities in the region with those related to geothermal development at Truckhaven would result in negligible increases in National Ambient Air Quality Standards criteria pollutants and would not cumulatively result in the region moving from attainment to non-attainment status under the Clean Air Act. There could be minor localized increases in exhaust from construction equipment and well field workers' vehicles creating haze.

Noise

Site-specific and sporadic increases in noise pollution would occur during exploration and development activities. Combined with other noise generators, such as OHV use, these could extend the time that noise is noticeable to residents or visitors to the area. Noise generated during operations would be from the power plants and vehicles of well field workers. Given that noise levels decrease (attenuate) over distance, the effect on ambient noise levels would be low and geothermal activities at Truckhaven would not cause a cumulative impact.

Other proposed projects noted above would also generate unspecified amounts of noise for unspecified lengths of time. It is impossible to quantify these impacts at this time, given the speculative nature of the future activities. It is reasonable to assume that given the attenuation of noise over distance, these activities would not combine with noise generated from geothermal development to create a cumulative impact.

Topography, Geology, and Geologic Hazards

Local changes in topography could be caused by construction of roads, well pads, pipelines, and the power plants. Up to 502 acres of land could be disturbed by geothermal leasing and development in the Truckhaven area. After construction, 405 acres of land would be committed to geothermal energy infrastructure for the life of the project. It is unknown precisely where development would occur, so it is unknown how much cut and fill would be necessary.

As noted in Section 4.3, the direct and indirect impacts of geothermal leasing on the Truckhaven area would be negligible on topography and geology. Given the type of development envisioned, it is not likely that seismic events would be triggered as a result of leasing. Because of these reasons, it is not likely that activities at Truckhaven in concert with other actions in the region would result in a cumulative impact on topography, geology or geologic hazards.

Soils

Soil erosion by wind and water has the potential for minor adverse impacts from geothermal energy exploration, development, and utilization over the life of the operations. The indirect impacts described in Section 4.4 would be combined with impacts from other activities to create additive soil impacts. A combination of impacts could generate other indirect impacts, such as increased sedimentation of waterways, impacts to aquatic species, deterioration of visual quality from fugitive dust during high wind events, liberation and suspension of particulate matter, and loss of viable soil to allow vegetation growth.

With the increase in miles of roads in Truckhaven from geothermal development, unauthorized OHV use could increase off-road usage in these areas and therefore lead to minor increased vegetation disturbance and soil erosion, especially during intense rainfall

events. Overall, soil erosion or sedimentation would be minor because of Truckhaven's relative flat topography, lack of significant rainfall throughout the year (although flash flooding does occur), and absence of surface drainage channels in the proposed action area. Several recently completed land use plans (as described under "Recreation") around the desert reduce OHV opportunities. These plans have reduced the areas available for OHV use in the region and have reduced the potential for soil erosion in those areas by maintaining existing vegetation coverage. But these cumulative actions have partially contributed to concentrating OHV activity onto fewer routes and thus have increased the potential for soil erosion in these remaining routes, especially during flash flooding events.

Under the RFD scenario, up to 502 acres of surface disturbance would occur initially, with a long-term disturbance of 405 acres. Mitigation measures would be required to minimize avoidable impacts from construction and other development activities. Soil loss from the Truckhaven area is expected to be minor given these mitigation measures and the area's topography and low rainfall. Flash flood events do cause significant erosion, but, given the sparse vegetation cover, impacts from these natural events would not be exacerbated by proposed activities in the Truckhaven area.

Other activities, such as OHV recreation, the Sunrise Powerlink, and potential state leasing in the area may contribute sedimentation to Tarantula Wash, San Felipe Creek, and eventually the Salton Sea. It is unlikely the activities in the Truckhaven area would have a cumulative impact when combined with other actions, given their locations and potential for impact.

Water Resources

As noted in Section 4.5, water to mitigate fugitive dust and cooling water would be required during construction and operations, respectively. The source for water would most likely be from a supplier. The amount of water needed for these purposes will be defined when a specific development proposal is filed with BLM and other responsible agencies. Cumulatively, sedimentation and possible contamination may occur to surface and groundwater from development and operations of Truckhaven as well as other activities in the region.

Vegetation

Indirect and cumulative impacts such as the introduction of invasive species could occur on lands adjacent to the Truckhaven Geothermal Leasing Area. The facilitation of seed dispersal could result from construction equipment transporting invasive species from the construction areas to adjacent lands along access roads and main roads. In addition, exploratory drilling or uncontrolled releases, spills, seepages, or well blowouts could result in the addition of toxic, mineralized, or saline geothermal waters to the soil, streams, ponds, or wetlands. This contamination could adversely impact vegetation growth and distribution, particularly for sensitive riparian and wetland vegetation. Although no riparian areas or wetlands exist within or immediately adjacent to the project

area, the San Sebastian Marsh is located to the south of the Truckhaven Geothermal Leasing Area. It is unlikely that such contamination would adversely impact the San Sebastian Marsh because of the distance between the project boundary and marsh and the location of SR-78. Therefore, no cumulative impacts are expected.

Fish and Wildlife (Other than Special Status Species)

Fish are often more sensitive than other wildlife or humans to contaminants of their environment; thus, they can be an indicator of the concentrations of these pollutants in aquatic bodies. Because of the depth of the geothermal wells (approximately 6,000 feet below ground surface) and because setbacks are already in place around pools to protect possible pupfish populations in the region, there would be negligible indirect impacts to surface pools, groundwater feeding these pools, or fish associated with them. Furthermore, based on the well depth and distance of the Salton Sea from the Truckhaven area (approximately 2 miles), there would be negligible indirect impacts to the fishes in the Salton Sea, as the geothermal activities would be unlikely to influence the groundwater associated with the sea, either individually or cumulatively.

Public lands sustain an abundance and diversity of wildlife and wildlife habitat. Wildlife is found in areas where their basic needs – food, shelter, water, reproduction, and movement – are met (Anderson 2001). At the landscape level (thousands to hundreds of thousands of acres) and stand level (up to thousands of acres), vegetation and habitats are in constant flux, changing and adapting to natural perturbations in the environment (Paige and Ritter 1999). As a result, habitat types have varied over time and distance and have resulted in different species groups being dominant at different times, depending upon the characteristics of the habitat. Loss of habitat is also an important factor contributing to the increase in the number of species listed as threatened or endangered in recent years.

Industrial activities, such as geothermal development, can substantially modify or eliminate habitat within and near the development footprint, although not all species are harmed by conversion of land to more intensive uses. Numerous species are adaptable to changes in their environments. For example, with the inundation of water into the Salton Sea from the Colorado River and the introduction of fish species, birds that utilize the Salton Sea during their migration have benefited from the increased food source.

Roads contribute to the cumulative impacts within the region. Even though existing roads would be used where possible, major improvements to existing roads and construction of new roads would be needed for full field development. This would disrupt soil development and increase the difficulties of rehabilitation during decommissioning. Furthermore, activities such as the construction of roads and ROWs have facilitated the spread of weeds. Noxious weeds and other exotic plants harm wildlife by reducing the amount of high quality forage and habitat complexity in an area from levels needed to support an abundance and diversity of wildlife (Payne and Bryant 1998). Increased traffic on roads would have an adverse impact on flat-tailed horned lizards from crushing by vehicles. It is not known, however, whether additional mortality

resulting from this project would, in combination with other actions, result in listing or extirpation of the species.

Thousands of avian species are killed each year from flying into power lines and other elevated structures associated with ROWs or transmission towers. With the increase in geothermal development in the area, this may contribute to avian mortality within the region. Power lines and poles serve as perches for predator avian species and could have an adverse cumulative impact on prey species, such as lizards and small game.

There is currently greater awareness than there has been historically on the part of BLM, other land management agencies, and the public on the effects of land-disturbing activities, such as fluid minerals development, on wildlife habitat. Better management of human-related disturbance factors through application of site-specific mitigation, standard operating procedures, reclamation and rehabilitation, and monitoring will continue to benefit wildlife habitat.

Special Status Species

Loss of habitat is also an important factor contributing to the increase in the number of species listed as threatened or endangered in recent years. No sensitive plant species occur within the proposed project area, but these species do occur in the surrounding areas. Although future development is likely, development would be limited to narrow ROWs with temporary disturbance from the installation of transmission lines. Furthermore, it is BLM policy to avoid critical habitat, which would reduce impacts to these plant species and habitat.

Roads contribute to the cumulative impacts within a region. Even though existing roads would be used where possible, major improvements to existing roads and construction of new roads would be needed for full field development. The temporary increased usage of surrounding roads for installation of the Sunrise Powerlink project could impact populations of flat-tailed horned lizards. This lizard freezes in response to danger, which makes it susceptible to mortality on roads and other areas of activity. Additional road construction would reduce available sandy habitat and may crush lizards and their burrows. However, because of the flat-tailed horned lizard's relatively low clutch size and its large home range, the temporary use of roads during transmission line construction, and limited surface-disturbing activities such as road construction, impacts would be unlikely to noticeably affect local lizard populations.

The development of NAFEC–Superstition Mountain would be similar to Truckhaven in its impacts on sensitive species and habitats. As a result, the two geothermal prospects may affect sensitive species, such as the desert pupfish, if both prospects influence groundwater sources important to this fish species. However, because of the vast geographic distance between Truckhaven and NAFEC–Superstition Mountain, impacts would be limited to site-specific areas and would not contribute to adverse cumulative impacts to the pupfish.

Activities such as the construction of roads and ROWs have facilitated the spread of weeds. Noxious weeds and other exotic plants harm wildlife by reducing the amount of high-quality forage and habitat complexity in an area from levels needed to support an abundance and diversity of wildlife (Payne and Bryant 1998).

As noted, the development of more transmission lines in the region may have a two-fold effect on avian species. Thousands of avian species are killed each year from flying into power lines and other elevated structures associated with ROWs and transmission towers. With the increase in transmission lines in the area, this may contribute to avian mortality within the region. These towers may also attract avian predators which would contribute to potential increased predation on local lizard populations, including the flat tailed horned lizard, within the region as well.

Adaptive management techniques would be utilized to minimize impacts to special status species present in the surrounding projects. Whenever possible, vehicle traffic would be relegated to existing roads. Permits would be required to delineate the presence of special status species in the area prior to any infrastructure development (see Section 2.1.5).

Cultural Resources

The Sunrise Project is being sited to avoid, where possible, sensitive cultural sites. The impacts to most identified significant cultural resources would be minimized by the Sunrise Project's prudent siting of the structure and other disturbance locations to avoid the locations of known resources.

Given the protections and mitigation measures of the National Historic Preservation Act, leasing and development at Truckhaven would not cause adverse impacts to cultural resources. As noted in Section 4.9, it is possible that increased human presence in the region could potentially lead to vandalism and inadvertent destruction of cultural artifacts. This would not be a cumulative impact, nor would it be a cumulative impact when combined with other ongoing or proposed actions in the region.

Paleontology

The Sunrise Project and other regional projects could result in disturbance of geologic formations with paleontological resource potential throughout the region. Monitoring by a qualified paleontological monitor would also be a site-specific requirement in areas where any excavation would occur in formations of moderate to high resource potential and would reduce any cumulative impacts to regional paleontological resources to a less-than-significant level.

As with the cumulative impacts to cultural resources, the proposed leasing of parcels in the Truckhaven area, including the development of up to 80 miles of access roads, would increase access to the Truckhaven area, increasing the potential for unauthorized OHV activity where currently OHV access is limited to existing roads. Currently, the areas for

leasing consideration allow OHV access only on designated trails. All other areas within the OWSVRA are otherwise closed to OHV use. Increased vehicular access to the area can result in both unintentional direct impacts from increased soil erosion and disturbance of surface resources and deliberate site vandalism or fossil hunting. As with all the projects occurring in the vicinity of the Truckhaven area, any ground-disturbing activity would be sited to avoid, where possible, sensitive paleontological sites. Ground-disturbing activities such as drilling and power plant development would require site-specific paleontological analysis, which may include surveys, recording of sites, and determinations of eligibility of paleontological sites that would be impacted. The primary cumulative impact to paleontological resources would be through the increased access, which could lead to unintentional direct impacts from increased soil erosion as well as disturbance of surface resources and deliberate site vandalism or fossil hunting.

Visual Resources

For this Final EIS, potential cumulative effects include those assessed for all land ownerships, including lands administered by other Federal agencies (i.e., the NAFEC land at Superstition Mountain, near the proposed action area) and non-Federal lands, especially regarding other energy projects.

The Sunrise Powerlink project would parallel SR-78 directly south of the leasing area and could in combination affect scenic quality. If full field development outlined in the RFD scenario were to occur in combination with the Sunrise Powerlink project, the overall scenic quality of the desert environment in and around Truckhaven would become more industrial. However, since the assumed location of the power plants and transmission lines proposed for geothermal leasing would not be visible from SR-78, the association of the Sunrise Powerlink project with either action alternative would not be considered a cumulative visual impact.

Lands and Realty

Cumulative impacts from management of lands and realty are limited to indirect on-the-ground impacts on other resources such as visual quality, water quality, and biological resources; therefore, leasing of geothermal resources at Truckhaven would not have a cumulative effect on the lands and realty program.

Human Health and Safety/Hazardous Materials

The combination of hazardous materials to develop and operate geothermal energy facilities at Truckhaven with other reasonably foreseeable activities in the area is expected to be negligible. There is a potential for hazardous waste spills (fuel, drilling muds, etc.), but the spills would be contained through use of BMPs described in Chapter 2 and would not be at a large enough geographic scale as to cumulatively combine with hazardous spills that could occur on other projects.

Energy and Minerals

By leasing 7,051 acres to 14,731 acres of BLM land to geothermal leases and up to 405 acres long term for facilities, BLM may limit future mineral development in the Truckhaven area. In addition, other activities proposed in the area may also limit certain mineral development opportunities. Sand and gravel are the only economically viable mineral resources in the area; since they are found throughout the region, the cumulative impact to mineral resources is considered negligible.

Recreation

OHV popularity in California continues to rise, and legal opportunities for OHV recreation continue to decrease. Several recently completed land use plans around the desert have reduced OHV opportunities. These cumulative actions have partially contributed to the increase of activity in the existing legal OHV open areas.

The California Department of Parks and Recreation has documented an increase of 52 percent in the usage of State Vehicle Recreation Areas between fiscal year 1986 and fiscal year 2000. Street-licensed four-wheel drive vehicle registrations in California have also increased 74 percent (290,651 to 506,585) between 1994 and 2001 (USDI BLM 2003a). Many of these street-legal vehicles are used in the OWSVRA and other OHV sites located elsewhere in Imperial County, such as the Imperial Sand Dunes Recreation Area.

As land pressures increase, the amount of available space for OHV use will decrease. Consequently, the possibility of recreational user satisfaction within the California Desert will decrease as the density of OHV use increases in the remaining legal areas. Cumulatively, these actions and trends could cause some displacement of OHV activity into the OWSVRA/Truckhaven area from other areas. It is also possible that some recreationists would be displaced to other areas, thereby causing additional impacts there. It is unknown and difficult to predict where the visitation shift would occur. It is possible the shift could occur into areas that currently require little recreational management or have a more sensitive habitat. With the implementation of appropriate mitigation measures to the project, impacts to recreational resources would be reduced. These measures could include timing construction to minimize impacts to recreational users in high-use areas and development/enhancement of recreational facilities and programs.

Given that around 1 percent of the Truckhaven project area would be devoted to geothermal energy infrastructure, it is reasonably expected that some recreational use would be affected by development. While mitigation measures would reduce or avoid many of the potential impacts to recreation, some long-term loss to existing routes could occur.

Special Areas

It is not likely that development at Truckhaven would be seen from the Fish Creek Mountains Wilderness Area except possibly a water plume on cool days. The plumes at the Salton Sea power plants (operated by CE Obsidian Energy LLC) would also been seen The possible observations of the energy infrastructure or the steam plumes discharged from the facilities from high elevations could cause a moderate long-term impact that might diminish some users' solitude and perception of nature in the wilderness area. .

There would be no indirect impacts to the San Sebastian Marsh/San Felipe Creek under any of the alternatives; therefore, there would also be no cumulative impacts.

For this Final EIS, potential cumulative effects include those assessed for all land ownerships, including lands administered by other Federal agencies (i.e., the NAFEC land adjacent to the proposed action area) and non-Federal lands, especially regarding recreation, air quality and terrestrial and aquatic species.

Social and Economic Conditions

The Salton Sea Unit #6 is a permitted geothermal power plant that is currently under construction in Imperial County. The permitting process for that project revealed no significant adverse socioeconomic impacts. Although the timing of any future development of the Truckhaven geothermal site cannot be specified, a geothermal project at that site is unlikely to generate socioeconomic impacts that would be significant when added cumulatively to the impacts of other projects that might occur in the future. The small scale of the proposed Truckhaven project and the limited scale of the socioeconomic impacts generated assure that it would not contribute to a significant cumulative impact.

In the context of the broader U.S. energy economy, development of the Truckhaven geothermal lease tracts would make a small contribution to a number of cumulative benefits. Because geothermal power production cost is low in the long run, it works toward generally lower electricity costs, and, because it has very low emissions, it avoids many of the social costs associated with mitigating air pollution, including health care costs.

Transportation and Traffic

Development and construction under the proposed action would result in up to 400 additional daily vehicle trips. During operations, this number would be reduced to 85 additional daily vehicle trips. Neither construction- nor operations-related traffic would adversely affect the LOS and would not contribute to cumulative impacts.

4.20 Irreversible or Irretrievable Impacts

NEPA requires an analysis of significant irreversible effects. Resources irreversibly or irretrievably committed to a proposed action are those utilized on a long-term or permanent basis. These include the use of nonrenewable resources such as metal, wood, fuel, paper, and other natural or cultural resources considered non-retrievable, in that they would be used for the proposed action when they could have been conserved or used for other purposes. An impact that also falls under the category of irreversible or irretrievable commitment of resources is the unavoidable destruction of natural resources that could limit the range of potential uses of that particular environment.

Vegetation

There are no anticipated irreversible impacts to vegetation. In the short-term, up to 502 acres would be affected, with a long-term loss of vegetation of 405 acres. In areas where plant habitat is lost or adversely impacted due to surface-disturbing activities or construction, remediation and revegetation techniques can be used to restore vegetation.

Fish and Wildlife

There would be no irretrievable or irreversible impacts to fish populations in the proposed action area. Wildlife habitat could be reduced under Alternatives 2 and 3, but habitat loss would not be permanent.

Special Status Species

It is anticipated 405 acres of the entire 40,320 acres of the Truckhaven Geothermal Leasing Area will be disturbed long term during the project lifetime, potentially affecting special plant species habitat. Portions of this habitat have the potential to be occupied by noxious weeds such as tamarisk or Sahara mustard. This impact should be negligible due to the area's precipitation being below that needed to support these weeds. It is expected that approved mitigation measures and adaptive management techniques would be utilized throughout the project to minimize this impact.

Wildlife habitat would be reduced under Alternatives 2 and 3, but habitat loss would not be permanent.

Visual Resources

Neglible, long-term visual impact but the proposed action conforms with management goals for VRM Class II and IV Management Areas.

Special Areas

Negligible but long-term loss of the perception of solitude in the Fish Creek Wilderness Region could result if geothermal infrastructure is observed from within the wilderness area.

There would be no impacts to the San Sebastian Marsh/San Felipe Creek because of the proposed action.

4.21 Short-Term Use Versus Long-Term Productivity of the Environment

The short-term uses of the environment associated with the action alternatives include those typically found with geothermal energy development. Short-term impacts associated with construction activities described in Chapter 2 (under a typical operations and the RFD scenario) include effects to the natural environment, cultural resources, recreation, and socioeconomic resources. These can be compared to the long-term benefits of the proposal, such as clean, renewable energy production for a growing regional population and economy.

4.22 Residual Impacts

Implementation of the proposed action would necessarily involve temporary and long-term impacts to the natural and cultural environments. Temporary impacts have been described in this chapter. Unavoidable and adverse impacts are summarized below. Mitigation measures (as feasible) for these impacts are included in Chapter 2 and would be applied as necessary in subsequent authorizations. The unavoidable and adverse impacts include:

- Long-term loss of 405 acres of vegetation, habitat, and soil. Habitat loss would not be permanent given the requirement to reclaim and restore disturbed areas during the decommissioning phase;
- Minor adverse air quality impacts from emissions from the power plants and well field workers' vehicles;
- Intermittent noise impacts from vehicles. Negligible, but long-term noise residual impact in the immediate vicinity of the power plants;
- Possible displacement of wildlife;
- Low probability of impacts to special status species due to increased mitigation;
- Possible loss of some OHV trails from access roads, pipelines, and other energy infrastructure; and
- Long-term visual impacts.

Chapter 5

Consultation and Coordination

5.0 Introduction

An Environmental Impact Statement (EIS) must be prepared when a Federal government agency considers approving an action within its jurisdiction that may have a significant impact on the human environment. Such an EIS aids Federal officials in making decisions by presenting information on the physical, biological, and social environment of a proposed project and its alternatives. The first step in preparing an EIS is to determine the project's scope, the range of action alternatives, and the impacts to be included in the document.

Council on Environmental Quality regulations (40 Code of Federal Regulations Parts 1500–1508) require an early scoping process to identify important issues, concerns, and potential impacts that require analysis in the EIS, to identify project alternatives, and to eliminate insignificant issues and infeasible alternatives from detailed analysis.

This chapter describes the consultation and coordination activities BLM conducted in the development of this Final EIS.

The CEQ regulations encourage Federal agencies to enter into formal cooperating agreements with other agencies, including those from state, local or Tribal governments. The California Department of Parks and Recreation served as a cooperating agency on this EIS.

The Truckhaven Geothermal Leasing Final EIS was prepared by a third-party contractor working under the direction of the BLM El Centro Field Office.

5.1 Public Participation

The Truckhaven Notice of Intent to Prepare an Environmental Impact Statement was published in the Federal Register on July 27, 2005 (Vol. 70, No. 143: 43449). Scoping documents were sent to the public listed on the BLM mailing list as well as to organizations, groups, and individuals requesting a copy of the materials. Thirteen written responses were received during the scoping period in response to the project.

BLM held public meetings during the scoping period in El Centro, San Diego, Long Beach, and Anaheim between August 3 and 10, 2005. It should be noted that at that time, the project scope included the Superstition Mountains geothermal resource area to the south of Truckhaven. Potential leasing in that area, which is under the jurisdiction of the U.S. Department of the Navy, will be analyzed in a separate National Environmental Policy Act (NEPA) document with the U.S. Department of the Navy as the lead agency.

5.1.1 Scoping Meeting Results

Although many of the comments heard during the scoping meetings related to issues in the Superstition Mountains area, comments were also made by members of the public, interest groups, and agency representatives regarding the Truckhaven proposal. These comments related to the impacts to vegetation, air quality, endangered species, surface and groundwater quality, and the Salton Sea, and the effects of hazardous materials generated by geothermal development. Table 5-1 identifies issues raised during the scoping meetings.

Table 5-1 Public Scoping Meeting Comments by Issue

Issues	El Centro	Long Beach	San Diego	Anaheim	Total
Aesthetics	0	0	1	3	4
Air	0	0	1	1	2
Biological resources	0	1	3	1	5
Cultural resources	1	0	2	0	3
Environmental impacts	0	0	2	0	2
Land use	2	0	0	1	3
Procedures	0	1	2	0	3
Public health	1	0	0	0	1
Recreation	2	3	11	15	31
Socioeconomics	2	0	0	2	4
Utilities	2	0	0	0	2
Wastewater	1	0	0	0	1
Water resources	2	1	1	1	5

5.1.2 Public Comments on Draft EIS

BLM held three meetings in various locations in Imperial County on March 19 and 20, 2007, to discuss the findings of the Draft EIS and to gather public comments. The meetings were held in Borrego Springs, Salton City, and El Centro and were attended by approximately 45 people. Approximately 600 letters and emails were received during the public comment period. As with the scoping comments, the vast majority of the comments related to impacts to off highway vehicle recreations from the proposed geothermal leasing.

5.2 Native American Tribal Consultation

To comply with Executive Orders regarding government-to-government relations with Native Americans and to comply with other Federal laws and regulations regarding Native American tribal issues, formal and informal contacts were made with a number of tribal entities at several points in the planning process. BLM initiated consultation with Native American tribes through letters, which were sent at the beginning of the NEPA process in 2005. A letter was sent to the chairman of each band or tribe that could have cultural ties to the project area, and a letter was sent to committee members, staff, or individuals who might have an interest in the project area. Each letter briefly explained

the project and requested comments on religious or cultural values that had the potential to be affected. In September 2006, additional letters were sent out to the tribes informing them that the NEPA process was still underway and re-inviting their participation. These entities will continue to be contacted and comments requested at key milestone points.

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Chapter 6

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The following individuals participated in the preparation of this EIS:

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Chapter 7

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