Haiwee Geothermal Leasing Area

Draft Environmental Impact Statement
and
Draft Proposed Amendment to the
California Desert Conservation Area Plan

BLM

Ridgecrest Field Office

Prepared for and under the direction of
Bureau of Land Management
Ridgecrest Field Office

April 2012

DOI No. 12-6

BLM MISSION STATEMENT

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

BLM/CA/ES-2012-005+1793

DOI No. 12-6

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Ridgecrest Field Office
300 S. Richmond Rd.
Ridgecrest, CA 93555
www.ca.blm.gov

In reply, refer to:
3200/1610(P)
CAD05000

April 2, 2012

Dear Reader:

I am pleased to announce the availability of the Haiwee Geothermal Leasing Area (HGLA) Draft Environmental Impact Statement (EIS) and Draft Proposed Amendment to the California Desert Conservation Area (CDCA) Plan. The EIS evaluates five alternatives, including the No Action and No Plan Amendment alternative, to address the potential environmental impacts of: (1) opening approximately 22,805 acres of Bureau of Land Management (BLM) managed federal mineral estate to geothermal exploration, development, and leasing; and (2) leasing approximately 4,460 acres of federal mineral estate for geothermal energy testing and development. A pending non-competitive geothermal leasing application could be approved consistent with the terms and conditions of the current CDCA Plan. If a lease application is approved, geothermal energy development would be assessed under a separate National Environmental Policy Act (NEPA) document.

This Draft EIS / Draft CDCA Proposed Plan Amendment has been prepared in accordance with the Federal Land Policy and Management Act (FLPMA) and NEPA. Public meetings to provide an overview of the document, respond to questions, and take public comments will be announced through the local media, BLM's website, and/or public mailings at least 15 days in advance of the meetings.

Comments may be submitted electronically at: cahaiwee@blm.gov, or by fax at: (951) 697-5299. Comments may also be submitted by mail to: California Desert District, 22835 Calle San Juan De Los Lagos, Moreno Valley, CA 92553, Attn: Peter Godfrey. To facilitate analysis of comments and information submitted, we encourage you to submit comments in an electronic format. Comments must be received within 90 days of the Environmental Protection Agency's publication of the Notice of Availability in the Federal Register to assure they are considered in the Final EIS.

Your review and comments on the content of this document are critical to the success of this planning effort. If you wish to submit comments on the Draft EIS / Draft Proposed Plan Amendment, we request that you make your comments as specific as possible. Comments will be more helpful if they include suggested changes, sources, or methodologies, and reference to a section or page number. Comments containing only opinion or preferences will be considered and included as part of the decision making process, although they will not receive a formal response from the BLM.

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

The Draft EIS has been sent to members of the public who requested a copy and to pertinent local, state, tribal, and federal government entities. CDs of the Draft EIS may be requested through any of the options previously listed above. You may also view the Draft EIS on our web page at http://www.blm.gov/ca/st/en/fo/ridgecrest/haiwee_geothermal.html .

For additional information or clarification regarding this document or the planning process, please contact the Project Manager, Peter Godfrey, at (951) 697-5385. We extend our appreciation for your cooperation, assistance, and continued participation.

Sincerely,

Michael Reiland
Acting Field Manager

EXECUTIVE SUMMARY

INTRODUCTION

The United States Department of the Interior, Bureau of Land Management (BLM) has prepared this Draft Environmental Impact Statement (EIS) and Draft Proposed Amendment to the California Desert Conservation Area (CDCA) Plan to evaluate the feasibility and potential environmental impacts of opening for lease approximately 22,805 acres of federal mineral estate for geothermal energy exploration and development. This Draft EIS analyzes the potential impacts of opening public lands to geothermal leasing and potential development of federally-owned geothermal resources in the Haiwee Geothermal Leasing Area (HGLA) in southwestern Inyo County, California. The HGLA is located east of the Inyo National Forest, west of the China Lake Naval Air Weapons Station, South of the South Haiwee Reservoir, and north of Little Lake. The BLM has the delegated authority to issue geothermal leases on federal mineral estate; specifically these federal mineral resources administered by the BLM.

A geothermal lease is for the conversion of geothermal energy into electric power. The BLM is authorized to enter into these leases as the manager of the geothermal resources included in the federal mineral estate. Leasing geothermal resources by the BLM vests with the lessee an exclusive right to future exploration and to produce and use of the geothermal resources within the lease area subject to existing laws, regulations, formal orders, and the terms, conditions and stipulations in or attached to the lease form or included as conditions of approval in permits. Lease issuance alone does not authorize any ground-disturbing activities. To explore for or develop geothermal resources, site-specific approval is required for any planned activities. Such approval could only be acquired following site and project specific National Environmental Policy Act (NEPA) and other environmental review.

PURPOSE OF AND NEED FOR ACTION

The purpose and need for amending the CDCA Plan is to establish a management framework for appropriate exploration and development of geothermal resources, based upon evaluation of the various social, land use, and environmental resources within the HGLA. The BLM's purpose and need for approving the pending lease applications for approximately 4,500 acres of federal mineral estate is to facilitate appropriate exploration and development of geothermal resources in the HGLA, consistent with the BLM's management of other important resources in the HGLA.

More specifically, the purpose of the action is to consider the role of geothermal energy and its use in responding to policy directives and congressional direction regarding (1) development of clean renewable energy, (2) meet the increasing energy demands of the nation, (3) reducing reliance on foreign energy imports, (4) reduce greenhouse gas emissions, and (5) improving national security. The purpose also includes responding to the increasing interest in geothermal leasing opportunities on federal land by "prescreening" land in the Haiwee geothermal leasing area.

The purpose includes support of Executive Order 13212, the Energy Act of 2005, Secretarial Order 3285, and California State's Renewable Portfolio Standards (RPS) Policy. In May of 2001, then-President Bush signed Executive Order 13212, Actions to Expedite Energy-Related Projects, which directed executive departments and agencies to increase production and transmission of energy in an environmentally safe manner. Congress passed the Energy Policy Act of 2005, which encourages the leasing and development of geothermal resources on federal lands and requires the Secretary of the Interior to establish a program for reducing the backlog of geothermal lease applications by 90 percent by August 8, 2010. The Secretary of the Department of the Interior issued Order 3285 to establish the development of renewable energy as a priority for the department. The State of California has adopted an aggressive RPS policy that demonstrates a commitment to shifting its electrical generation portfolio to the production and use of renewable energy sources. California's RPS requires that 20% of energy generated and distributed in the state is from renewable energy sources by the year 2010; by the year 2020, that requirement grows to 33%

The need for federal action and this EIS arises from three non-competitive lease applications that are currently pending with BLM for approximately 4,460 acres of federal mineral estate within the proposed HGLA. These applications were submitted prior to the passage of the Energy Act of 2005 and continue to be part of the backlog of applications that need to be acted upon. In evaluating these applications a need was also identified to allocate a broader area of designated lands (see Figures 1.1-3 and 2.2-1) as closed, open, or open with constraints to geothermal leasing. This need was accompanied by the need to consider appropriate constraints, stipulations, best management practices, and procedures to conserve resources and other uses that may be proposed for consideration by the BLM in the future.

The need for action includes consideration of a Plan Amendment to the CDCA Plan 1980 as Amended to classify the land in the HGLA as suitable or unsuitable for geothermal leasing. The Plan Amendment, if necessary, would be consistent with the determination to allocate specific lands within the HGLA as closed, open, or open with constraints to geothermal leasing.

DOCUMENT SCOPE AND LEASING AREA

This EIS analyzes the potential environmental, social, and economic effects of several alternatives. The document has been prepared in accordance with the National Environmental Policy Act (NEPA), Council of Environmental Quality's (CEQ) regulations for implementing NEPA (40 Code of Federal Regulations 1500-1508), the Department's regulations for implementing NEPA (43 CFR Part 46), and the Federal Land Policy and Management Act (FLPMA, Public Law 109-58) and its implementing regulations.

The HGLA consists of an estimated 21,233 acres of BLM administered public surface lands and approximately 1,572 acres of mineral estate where the surface lands are not federally owned; this area also includes the area subject to three pending geothermal lease applications for approximately 4,460 acres of BLM administered public lands. The lands considered for geothermal leasing are located in the Mount Diablo Meridian (see Appendix I) and generally occupy all or portions of the following 37 sections:

Township 21 South, Range 37 East, Sections 11-14, 23-26, 35-36
Township 21 South, Range 38 East, Sections 7-10, 15, 17-22, 27-34
Township 22 South, Range 37 East, Sections 1-2, 11-12
Township 22 South, Range 38 East, Sections 5-8

This document will allow BLM to classify the lands within the HGLA as to suitability for geothermal leasing. This document does not allow or authorized any ground disturbing activities. Any potential disturbance would need further evaluation under NEPA and other applicable authorities prior to the BLM making a decision regarding a specific proposed plan.

SCOPING

The Notice of Intent (NOI) for the HGLA was published in the Federal Register on September 11, 2009. The NOI also announced that the leasing of public lands will require an amendment to the CDCA Plan. Scoping documents were sent to members of the public listed on the BLM's mailing list as well as to organizations, groups, and individuals requesting copies of the materials.

The BLM conducted four public scoping meetings between October 13 and October 20, 2009, in Lone Pine, Bishop, Ridgecrest and Death Valley, California. During the scoping process, BLM received 14 comment letters and numerous verbal comments at the scoping meetings. Comments were made by members of the public, Native American Tribes, interest groups, and agency representatives. These comments related to geothermal development impacts on air quality, water resources in Rose Valley, endangered species, recreation, agriculture, water well owners, population and housing in Inyo County, spiritually important Native American Sites, and the Coso Hot Springs. Additional comments related to potential land management plan conflicts, suggestions of alternatives, the potential need for upgrade of transmission lines or substation construction, the preservation of geothermal reservoirs, potential wastewater and heat and emission hazards to the public, noise generation levels, and transportation of construction materials and workforce.

Comments also included inquiries about the cumulative impacts of other geothermal projects in close proximity to the Haiwee area, and the conformance of the project with the CDCA Plan, the Northern and Eastern Mojave Plan, and the West Mojave Plan.

With the release of this Draft EIS, a Notice of Availability will be published in the Federal Register, and a 90-day comment period will commence. During this period, BLM will conduct formal public meetings in order to obtain additional comments from interested parties, and to discuss the analysis in this Draft EIS.

ALTERNATIVES

Alternative A: Open the Entire HGLA for Geothermal Leasing

All BLM administered public lands within the proposed HGLA would be deemed as suitable and open to geothermal exploration and leasing under this alternative. The CDCA Plan would be amended to classify all land within the HGLA open to geothermal leasing. The three pending geothermal lease applications would be authorized.

Groundwater extraction for consumptive use during exploration, development, and project operations activities may be allowed for some leasing applications, to the extent that groundwater use, in combination with all other authorized groundwater uses, does not exceed the safe yield or recharge rate to the Rose Valley Aquifer as specified by stipulation and other restrictions.

Alternative B: Close the Entire HGLA to Geothermal Exploration and Development

BLM administered public lands located within the HGLA would be closed to geothermal leasing and the CDCA Plan would be amended to close the land within the HGLA to geothermal leasing under this alternative. Consequently, the pending geothermal applications would be denied.

<u>Alternative C</u>: Open the HGLA to Geothermal Exploration and Development with No Surface Occupancy Allowed in Sensitive Areas (Preferred Alternative)

All BLM administered public lands within the proposed HGLA would be identified as open and available for geothermal exploration, development, and leasing under this alternative. Specific acreage within the HGLA would be identified as available for geothermal development, but subject to no surface occupancy restrictions to protect sensitive resources. The sensitive resources area restriction is defined by stipulation and is largely expressed by the recognized Mojave ground squirrel core habitat. The CDCA Plan would be amended to find all land within the HGLA as suitable for geothermal development. The three pending geothermal lease applications encompass lands both within and outside of the sensitive resources area and would be authorized, subject to these limitations.

Groundwater extraction for consumptive use will be prohibited or strictly controlled by stipulation throughout the entire HGLA.

<u>Alternative D</u>: Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development

Specific acreage within the HGLA would be identified as open and available for geothermal development. Other, separate areas within the HGLA would be identified by stipulation as closed and unavailable for geothermal development in order to protect sensitive resources. The sensitive resource area is largely expressed by the Mojave ground squirrel core habitat. The CDCA Plan would be amended to identify the sensitive resource area within the HGLA as closed and unavailable to geothermal development. The CDCA Plan would also be amended to classify the balance of the land within the HGLA as suitable for geothermal development. The three pending geothermal lease applications would be authorized, with modifications

Groundwater extraction for consumptive use will be prohibited or strictly controlled by stipulation throughout the entire HGLA.

<u>Alternative E</u>: No Action

This alternative would not change the current management of the BLM administered public lands within the HGLA. The CDCA Plan would not be amended and the pending applications for geothermal development would be denied.

REASONABLY FORESEEABLE DEVELOPMENT SCENARIO

The BLM has prepared a Reasonable Foreseeable Development (RFD) scenario as a basis for analyzing environmental impacts resulting from potential future leasing and development of federal geothermal resources within the HGLA. There is currently no direct data on which to base the RFD scenario, such as known temperature gradient wells or deep exploration wells within the area. Most of the HGLA, however, is within the Coso Known Geothermal Resource Area (KGRA), an area term no longer in wide use. The KRGA recognizes the potential for a geothermal resource largely due to related geologic features and structures. The Coso geothermal field is also within the KGRA and located approximately three miles southeast of the easternmost boundary of the HGLA. The Coso field is used as an analog for evaluation of geothermal resource potential within the HGLA. The Coso geothermal field is located on the China Lake Naval Air Weapons Station in proximity to the project area. The Coso geothermal field currently produces approximately 200 megawatts (MW) of electricity from a total of nine 30 MW geothermal turbine/generators. The Coso field is located in an area of relatively recent volcanic activity. This volcanic activity included intrusion of magma to shallow depths, thereby providing an accessible heat source for the geothermal field. There is likelihood that the HGLA may have a similar resource.

For the purpose of the RFD, it will be assumed that the productive areas will be less prolific than in the Coso geothermal field, the resource will be deeper, and more wells will be required per MW than in the Coso geothermal field. The RFD also assumes that two 30 MW power plants would be constructed, each of which would operate for 30 years. A total of 15 production wells and seven injection wells would be drilled over the 30-year operational life period in order to maintain the 30 MW of net production at each power plant. It was assumed that the RFD scenario could occur on any land within the HGLA, regardless of surface or mineral ownership. Total disturbance from the two plants was estimated to be 384 acres during construction and then 276 acres during operation.

ENVIRONMENTAL CONSEQUENCES

Designating lands for geothermal leasing potential, amending the CDCA Plan to allow for leasing and development, and authorizing geothermal leases do not result in any direct impacts as defined by CEQ regulations, which state that such effects "are caused by the action and occur at the same time and place" (40 CFR 1508.8). It is reasonable, however, to foresee that real impacts could occur if the BLM issues geothermal leases, but that those impacts would not occur until a separate BLM action authorized development following that lease issuance, at some point in the future. Therefore, the analysis in the Draft EIS addresses both direct and indirect impacts based on the foreseeable actions associated with leasing for development which would include exploration, drilling, and utilization. These impacts have been analyzed for the entire HGLA based on the RFD scenario. Additional site specific analysis would be conducted during the permitting review process for subsequent proposed exploration, drilling, and utilization activities. General impacts from a proposed exploration, drilling, or utilization action could potentially occur to the following resources and uses:

- **Air Quality and Climate**: Short-term increase in air emissions associated with construction of the geothermal power plants. Minimal emissions are associated with operation of a geothermal power plant and therefore such development and operation are likely to have a beneficial impact in reducing emissions and greenhouse gases on a more regional level;

- **Noise**: Minor short term impacts in proximity of drilling and other activities in addition to minor long term impacts associated with operations;

- **Topography, Geology, Seismicity**: Minimal impacts to geology, including 384 acres of surface disturbance, and a local minor seismicity hazard associated with injection wells;

- **Soils**: Disturbance of 384 acres expected from the Reasonably Foreseeable Development would include compaction, but is less than 2% of the available acres. This would go along with some minor long-term loss of soils;

- **Water Resources**: Short-term impact during exploration and development activities;

- **Biological Resources**: Long-term loss of vegetation and habitat associated with roads and other surface disturbance. This could impact several special-status species such as the Mojave Ground Squirrel and the Desert Tortoise;

- **Cultural Resources**: Impacts would be minor or negligible due to the ability to redesign or modify projects to avoid significant disturbance;

- **Paleontology**: No adverse impacts would be expected due to the low probability of occurrence;

- **Visual Resources**: Variable long-term impact from the presence of the power plants and associated infrastructure such as wells, access roads, and power lines. Variability ranges from low to high impacts based on the point of view and the locations of the potential power plants;

- **Lands and Realty**: Impacts would be low based on recognition of existing use classifications and prior existing rights;

- **Public Health and Safety**: Impacts are expected to be low based on BLM lease conditions and applicable requirements;

- **Energy and Mineral Resources**: Potential for impacts is considered low, since geothermal development is not incompatible with mining operations;

- **Wild Horses and Burros**: There is a low expectation of occurrence due to adherence with applicable laws, regulations, and requirements;

- **Grazing**: Impacts are considered low and limited to the loss of lands available for other uses (384 acres expected from the Reasonably Foreseeable Development). There are two grazing allotments present in the HGLA with each having only about 3% to 4% of their respective allotment found within the HGLA;

- **Recreation**: Short term impacts from construction and long term impacts in the immediate vicinity of any development facilities would be low overall. It would include loss of acreage, road use conflicts, and visual impacts, but would be offset by potentially better access through new road construction;

- **Special Designations**: The potential for impacts is considered low due to consideration of current regulations and requirements;

- **Traffic / Transportation**: Impacts to traffic and transportation would be considered low since any expected increase in traffic would be a negligible increase in the regional traffic flow;

- **Socioeconomics**: Potential impacts include an increase in employment, economic benefits, and public revenue, along with other potential impacts such as the decrease in available housing and public services. These are expected to be low and short-term.

Many of the ground disturbing impacts associated with biological resources, cultural resources, earth resources, water resources, and water quality can be appropriately mitigated or avoided through site specific BMPs, stipulations, and siting designs. These can be identified during analysis performed for the evaluation of specific proposed leasing and development actions. Appropriate mitigation measures, such as avoidance and no surface occupancy, could be implemented as part of the proposed action to reduce these impacts.

Cumulative effects associated with geothermal development would be minor in nature, mainly due to the limited number of other past, present and reasonably foreseeable projects within the planning area. Proponents of several other energy developments have applied for right-of-way grants or proposed projects within the HGLA. This is analyzed in detail in the Cumulative Effects section of Chapter 4.

ORGANIZATION OF THIS DOCUMENT

Chapter 1 provides an introduction, discussion of the purpose of and need for action, and information about the programs and policies that relate to the purpose and need. Chapter 2 presents the proposed action and a reasonable range of alternatives, including appropriate stipulations, Best Management Practices (BMPs), and procedures that are associated with geothermal leases. It also includes information on the phases of geothermal resource development, and describes BLM's reasonably foreseeable development scenario. Chapter 3 describes existing environmental conditions of the HGLA and vicinity. Chapter 4 evaluates the potential direct, indirect, and cumulative impacts of the proposed action and alternatives. Chapter 5 describes the activities that have taken place and are planned for the coordination and consultation process with the public and agencies. Chapter 6 is comprised of a list of preparers of this Draft EIS, and Chapter 7 lists the references cited in this document. There are nine appendices included in this Draft EIS (Appendices A through I).

Abbreviations and Acronyms

AAGR	annual average growth rate
AB	Administrative Bill
ACEC	Area of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
ac-ft/yr	acre feet per year
AGD	allowable ground disturbance
AICUZ	Air Installation Compatible Use Zone
AIRFA	American Indian Religious Freedom Act
AML	Abandoned Mine Lands
AMP	Allotment Management Plans
amsl	above mean sea level
APCD	Air Pollution Control District
APE	Area of Potential Effects
APLIC	Avian Power Line Interaction Committee
AQCMM	Air Quality Control Mitigation Measures
ARB	Air Resources Board
ARPA	Archaeological Resources Protection Act
ASTM	American Society for Testing and Materials
AUM	Animal Unit Months
BGEPA	Bald and Golden Eagle Protection Act
bgs	below ground surface
BLM	Bureau of Land Management
BMP	Best Management Practices
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
Cal-IPC	California Invasive Plant Council
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CCD	Census County Division
CDCA	California Desert Conservation Area
CDFG	California Department of Fish and Game
CDOF	California Department of Finance
CDP	Census Designated Place
CDPA	California Desert Protection Act
CDWR	California Department of Water Resources

CEC	California Energy Commission
CEDD	California Employment Development Department
CEQ	Council of Environmental Quality
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane
CHL	California Historical Landmarks
CHRIS	California Historical Resource Information System
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	CO_2 equivalent
COC	Coso Operating Company
COM Plan	Construction, Operation, and Maintenance Plan
CPUC	California Public Utilities Commission
CRHR	California Register of Historical Resources
CRMP	Cultural Resource Management Plan
CRUP	Cultural Resource Use Permit
CSLC	California State Lands Commission
CSU	Controlled Surface Water
CUP	Conditional Use Permit
CWA	Clean Water Act
dB	decibels
dB(A)	A-weighted decibels
DC	Direct Current
DOGGR	California Dept of Conservation, Division of Oil, Gas & Geothermal Resources
DOI	United States Department of the Interior
DSCF	dry standard cubic feet
DWMA	Desert Wildlife Management Area
EA	Environmental Assessment
EIC	Eastern Information Center
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EMF	Electromagnetic Field

ERMA	Extensive Recreation Management Area
ESA	Endangered Species Act
°F	degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FLPMA	Federal Land Policy and Management Act
FOIA	Freedom of Information Act
FR	Federal Register
Ft^2/day	square feet per day
GBUAPCD	Great Basin Unified Air Pollution Control District
G-E-M	Geology-Energy-Minerals
GHG	Green House Gas
GIS	geographic information system
GRDA	geothermal resources development account
GWP	global warming potential
HCP	habitat conservation plan
HGLA	Haiwee Geothermal Leasing Area
HMMP	Hydrologic Monitoring and Mitigation Plan
hp	horsepower
HPTP	Historic Properties Treatment Plan
H_2S	hydrogen sulfide
ICC	Inyo County Code
IM	Instruction Memorandum
Kf	water erosion factor
KGRA	known geothermal resource area
km	kilometer
KOP	key observation point
kph	kilometers per hour
kV	kilovolt
LADPW	Los Angeles County Department of Public Works
LADWP	Los Angeles Department of Water and Power (City of Los Angeles)
L-C-M	Lacy-Cactus-McCloud
L_{dn}	day-night average noise level
L_{eq}	equivalent, average sound level
LORS	Laws, Ordinances, Regulations and Standards

LOS	Level of Service
M	Magnitude
MBTA	Migratory Bird Treaty Act
MDM	Mt. Diablo Meridian
MEQ	micro-earthquake
mg/L	milligrams per liter
MGSCA	Mojave Ground Squirrel Conservation Area
mph	miles per hour
MUC	multiple use class
MW	megawatts
N_2O	nitrous oxide
N/A	not applicable
ND	No Date
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection Act
NAHC	Native American Heritage Commission
NAWS	Naval Air Weapons Station
NCEC	Northern California Earthquake Center
NCG	non-condensable gases
NEMO	Northern and Eastern Mojave
NEPA	National Environmental Policy Act
NFS	National Forest Service
NHL	National Historic Landmark
NHPA	National Historic Preservation Act of 1966
NO_2	nitrogen dioxide
NOI	Notice of Intent
NOTS	Naval Ordnance Test Station
NOx	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NPS	United States Department of the Interior, National Park Service
NRCS	Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NSO	No Surface Occupancy
O_3	ozone
OEHHA	California Office of Environmental Health Hazard Assessment

OHP	Office of Historic Preservation *(in the California Department of Parks and Recreation)*
OHV	off-highway vehicles
Pb	lead
PFYC	Potential Fossil Yield Classification
PM_{10}	suspended particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$	fine particulate matter less than or equal to 2.5 microns in diameter
ppb	parts per billion
ppm	parts per million
PRPA	Paleontological Resource Preservation Act
REIS	Regional Economic Information System
RFD	reasonably foreseeable development
RFO	Ridgecrest Field Office
RMP	Resource Management Plan
ROD	Record of Decision
ROG	reactive organic gases
ROW	right of way
RPS	Renewable Portfolio Standard
RV	recreational vehicle
RWQCB	Los Angeles County Regional Water Quality Control Board
SAA	Streambed Alteration Agreement
SB	Senate Bill
SCAB	South Coast Air Basin
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SCEC	Southern California Earthquake Center
SDG&E	San Diego Gas and Electric
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SO_2	sulfur dioxide
SPER	Statewide Portable Equipment Registrations
SQRU	Scenic Quality Rating Units
SR	State Route
SRMA	Special Recreation Management Act
SSA	socioeconomic study area
SWPPP	Stormwater Pollution Prevention Plan

SWRCB	State Water Resources Control Board
TAC	toxic air contaminants
TCP	traditional cultural properties
TDS	Total Dissolved Solids
TGA	Taylor Grazing Act
TL	timing limitations
TWRA	Tehachapi Wind Resources Area
µm	microns
µg/m^3	micrograms per cubic meter
U.S.	United States
US 395	U.S. Highway 395
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USEPA	United States Environmental Protection Agency
USFS	United States Department of Agriculture, Forest Service
USFWS	United States Department of the Interior, Fish and Wildlife Service
USGS	United States Geological Survey
VOC	Volatile Organic Compounds
VRI	Visual Resource Inventory
VRM	Visual Resource Management
WECC	Western Electricity Coordinating Council
WEMO	West Mojave
WRCC	Western Regional Climate Center

CHAPTER 1

INTRODUCTION

AND

PURPOSE AND NEED

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

FIGURES:

CHAPTER 1 INTRODUCTION AND PURPOSE AND NEED

1.1 PROJECT OVERVIEW

1.1.1 Introduction

The Bureau of Land Management (BLM) is evaluating various alternatives addressing approximately 22,805 acres of BLM-administered public lands within the Haiwee Geothermal Leasing Area (HGLA) and geothermal leasing. These lands comprise an estimated 21,233 acres of surface lands that include the subsurface mineral rights and approximately 1,572 acres of "split estate" land, where the surface is not federally owned, but the mineral rights are. (See Appendix I) The HGLA is located in southwestern Inyo County, California, east of the Inyo National Forest, west of the China Lake Naval Air Weapons Station, and South of the South Haiwee Reservoir as shown in Figures 1.1-1 Regional Setting, 1.1-2 Aerial View, and 1.1-3 Designated Routes. In addition to federally owned lands, the HGLA also includes state and privately owned lands, as well as some acres that are mixed estate, or private surface ownership with federal mineral resource ownership. The lands within the HGLA are located in the Mount Diablo Meridian (see Appendix I) and occupy all or certain portions of the following 38 sections:

Township 21 South, Range 37 East, Sections 11-14, 23-26, 35-36
Township 21 South, Range 38 East, Sections 7-10, 15, 16-22, 27-34
Township 22 South, Range 37 East, Sections 1-2, 11-12
Township 22 South, Range 38 East, Sections 5-8

There are currently three pending geothermal lease applications covering about 4,460 acres of BLM-administered public lands in this area (See Figure 1.1-3). These applications have been serialized as CACA 43998 (approximately 1,280 acres), CACA 43993 (approximately 2,540 acres), and CACA 44082 (approximately 640 acres). The BLM will decide whether or not to amend the CDCA Plan to make all or a portion of the HGLA available to geothermal leasing and development. The BLM will also decide whether or not to issue leases for one or more of these three pending lease applications.

Geothermal resources are federal mineral resources administered by the BLM. Amending a land use plan to allow the leasing of geothermal resources and issuing leases of geothermal resources on federally administered public lands are federal actions subject to compliance with the National Environmental Policy Act (NEPA). The BLM has prepared this Environmental Impact Statement (EIS) and Proposed Plan Amendments in compliance with the NEPA Council on Environmental Quality (CEQ) Regulations (40 CFR 1500-1508) and the Federal Land Policy and Management Act (FLPMA) of 1976 (Public Law 94-579) respectfully. The EIS analyzes and discusses the feasibility and potential environmental impacts of geothermal leasing of federally administered public lands within the HGLA.

Route designation changes may be made in the future as a part of development projects, if approved. (See Figure 1.1-3 for currently designated routes.) A project-specific NEPA analysis would be required for route designation changes and generally this process would not require a plan amendment. This approach to route management would be in accordance with the BLM's Comprehensive Travel and Transportation Management policy (IM 2008-14) and BLM Manual 1601, Appendix C, Section II D.

The BLM proposes to amend the CDCA Plain to incorporate decisions concerning the availability of all or part of the HGLA for geothermal exploration and development. In addition, the BLM proposes to grant each of the three leases identified above. As detailed below, the purpose and need for amending the CDCA Plan is to establish a management framework based upon evaluation of the various social, land use, and environmental resources within the HGLA, with a focus on appropriate exploration and development of geothermal resources, as well as consideration of other renewable resources (wind and solar energy). The BLM's purpose and need for granting the pending leases is to facilitate appropriate exploration and development of geothermal resources in the HGLA, consistent with the BLM's management of other important resources in the HGLA. The BLM does not authorize any specific energy development or FLPMA right of way based on the decisions from this EIS. Issuance of a lease for geothermal resources lays the groundwork for future exploration and development, but does not confer the right for any activities involving ground disturbance or activities that may impact the resources of the lease area. Any future geothermal project or other energy exploration and development that may be proposed within the HGLA will be evaluated under a separate NEPA analysis on a site and project-specific basis.

FIGURE 1.1-1 Regional Setting with Vicinity Projects

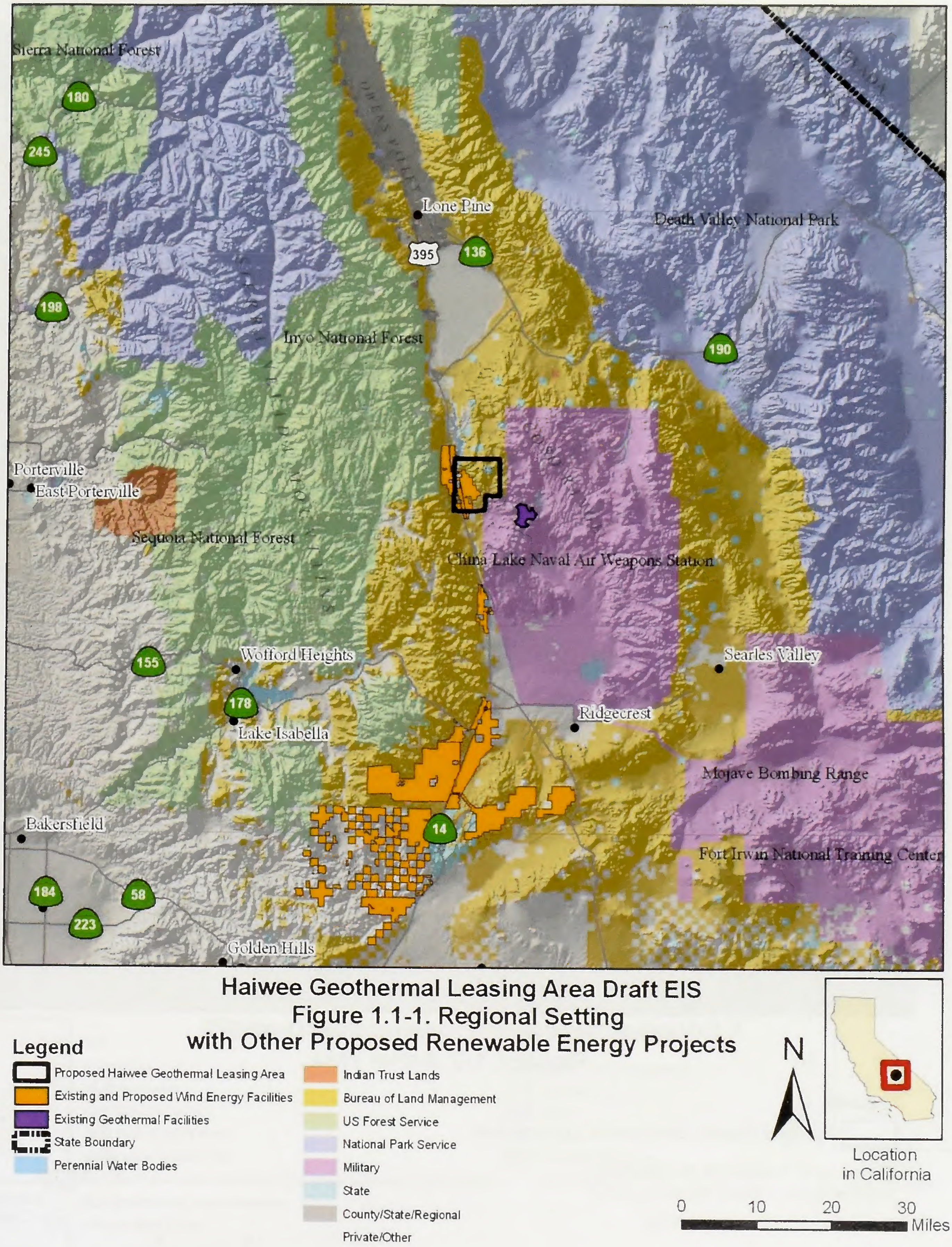


FIGURE 1.1-2 Aerial View

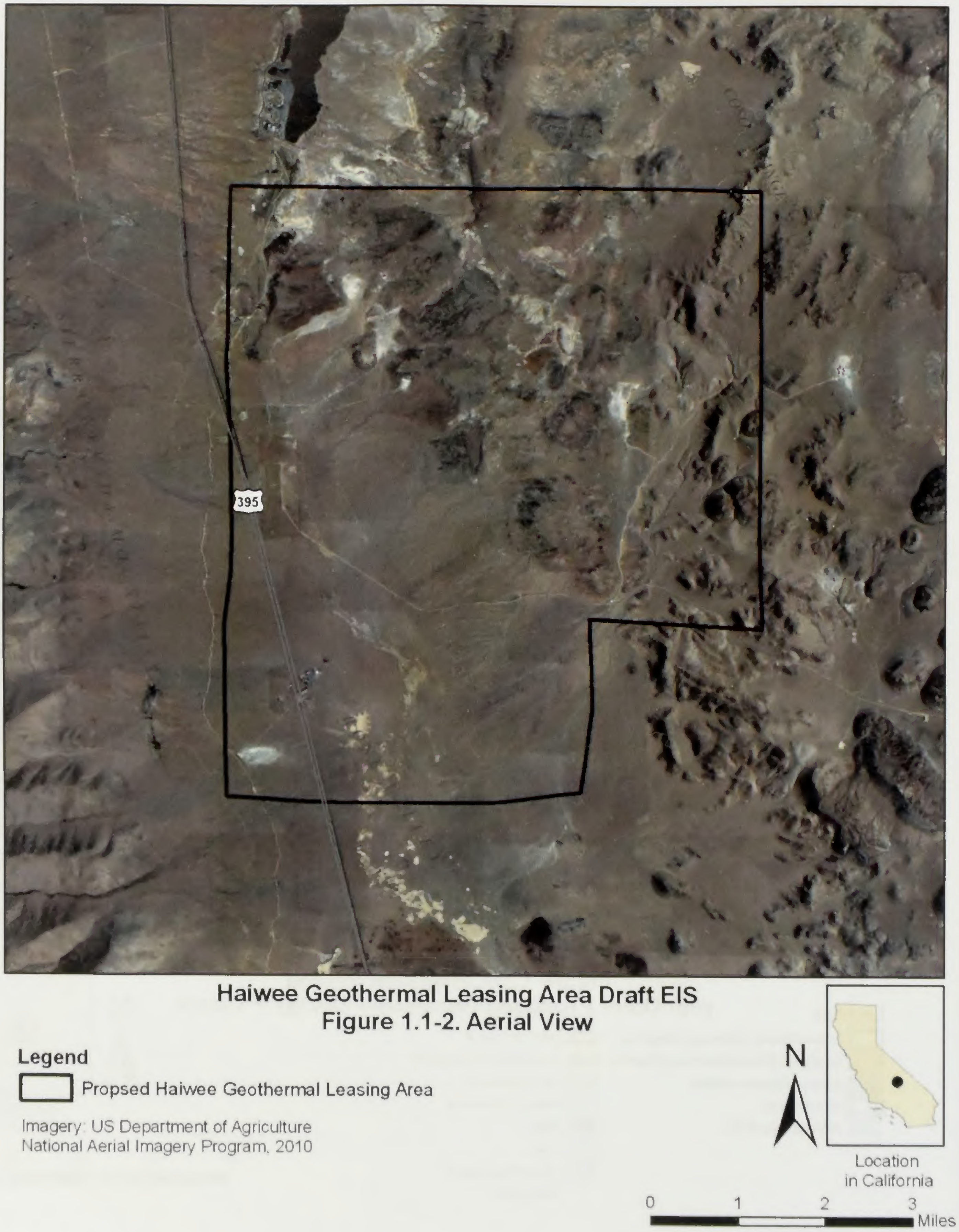
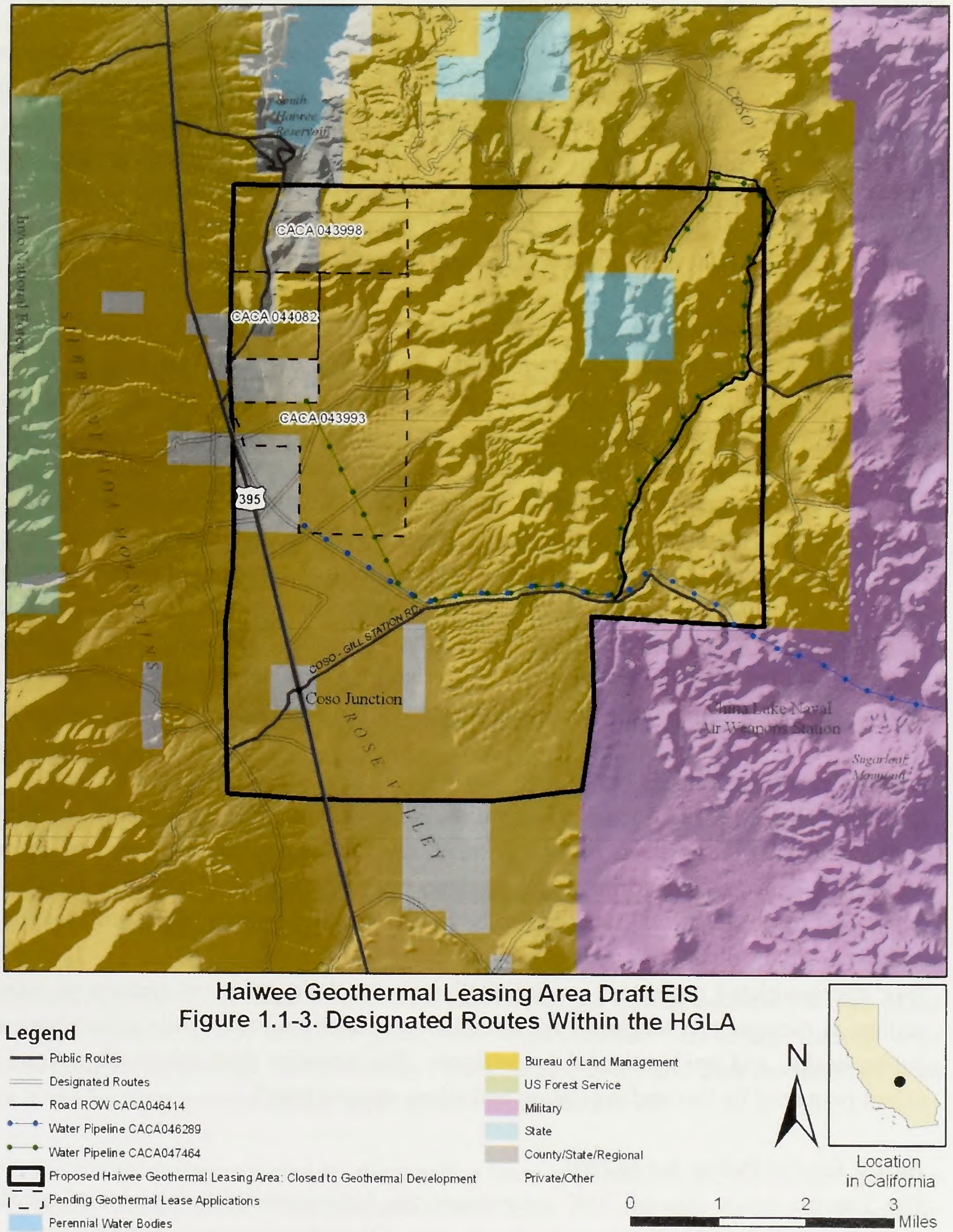


FIGURE 1.1-3 Designated Routes and Pending Geothermal Lease Applications



1.2 BLM PURPOSE AND NEED FOR THE PROPOSED ACTION

1.2.1 Purpose of Action

The purpose of the action is to consider the role and use of geothermal energy with regard to (1) developing clean renewable energy, (2) meeting the increasing energy demands of the nation, (3) reducing reliance on foreign energy imports, (4) reducing greenhouse gas emissions, and (5) improving national security. The purpose also includes responding to the increasing interest in geothermal leasing opportunities on federal land by addressing three pending geothermal lease applications and by "prescreening" land in the HGLA for its suitability for this kind of development through the planning process.

The purpose includes support of Executive Order 13212, the Energy Policy Act of 2005, Secretarial Order 3285, and California State's Renewable Portfolio Standards (RPS) Policy. On May 18, 2001 President George W. Bush signed Executive Order 13212: Actions to Expedite Energy-Related Projects, which directed executive departments and agencies to increase production and transmission of energy in an environmentally safe manner. Congress passed the Energy Policy Act of 2005, which encourages the leasing and development of geothermal resources on federal lands and requires the Secretary of the Interior to establish a program for reducing the backlog of geothermal lease applications by 90 percent by August 8, 2010. The State of California has committed to an aggressive RPS policy that shifts its generation portfolio to the production and use of renewable energy sources. California's RPS requires that 33 percent of energy generated and distributed in the state be produced from renewable energy sources by the year 2020.

1.2.1.1 Executive Order 13212

Executive Order 13212: Actions to Expedite Energy-Related Projects states, "The increased production and transmission of energy in a safe and environmentally sound manner is essential." Executive departments and agencies were 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, "For 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."

1.2.1.2 Energy Policy Act of 2005

The Energy Policy Act of 2005 encourages the leasing and development of geothermal resources on federal lands. Specifically, Section 225 of the Act requires the Secretary of the Interior to establish a program for reducing the backlog of geothermal lease applications that were pending as of January 1, 2005 by 90 percent. This backlog has now been addressed.

Section 211 of the Act also provides a ten-year goal for the Secretary of the Interior to seek approval of non-hydropower renewable energy projects located on public lands with a total generation capacity for all projects of at least 10,000 megawatts of electricity, including electricity from geothermal resources.

Section 222(d)(1) of the Energy Policy Act of 2005 states, "It shall be a priority for the Secretary of the Interior to ensure timely completion of administrative actions, including amendments to applicable Resource Management Plans (RMP), necessary to process applications for geothermal leasing pending on the date of enactment of this subsection." This section also contains the requirement that, "all future RMPs for areas with high geothermal resource potential shall consider geothermal leasing and development."

1.2.1.3 Secretarial Order 3285

This Order establishes the development of renewable energy as a priority for the Department of the Interior and establishes a Departmental Task Force on Energy and Climate Change. This Order also amends and clarifies Departmental roles and responsibilities to accomplish this goal.

1.2.1.4 Assist State of California in Meeting its Renewable Portfolio Standard Goals

The opening of federal lands to geothermal leasing may assist the state of California in meeting its Renewable Portfolio Standard (RPS) goal of 33 percent of its energy derived from renewable resources by the year 2020. Geothermal energy is a renewable resource that provides reliable and consistent base load power, unlike solar or wind power generation, which are intermittent renewable energy sources. Geothermal development has the potential to make notable contributions to meeting the state's RPS goals.

1.2.2 Need for the Action

The need for action is to allocate specific lands in the HGLA as closed, open, or open with constraints to geothermal leasing. This EIS arises from three non-competitive lease applications that are currently pending with the BLM for approximately 4,460 acres of federal mineral estate. The need for action includes making a leasing decision for each of the three applications to grant, deny, or grant with modifications. These applications were received prior to the passage of the Energy Policy Act of 2005, and thus are included with others in the backlog covered by the requirement mentioned above.

In addition to the acreage covered by the pending lease applications, the BLM has identified approximately 18,000 acres of BLM-administered lands that may have potential to contain geothermal resources. These identified lands are located within the HGLA and are adjacent to the three pending leases along with approximately 1,630 acres of private land. For the public land and the portions of this private land for which BLM owns the mineral rights, the need for action includes determining whether these lands, or portions thereof, should be available for geothermal leasing.

The need for action includes making a determination about what terms, conditions and stipulations for development may apply, should any lands within the HGLA be made open for geothermal energy exploration and development.

1.2.2.1 Amend the CDCA Plan

The CDCA encompasses 25 million acres of land in Southern California designated by Congress through the Federal Land Policy and Management Act (FLPMA) of 1976. The BLM directly administers about 10 million acres of the CDCA, which includes the HGLA. The CDCA Plan provides overall regional guidance for management of the public lands within the CDCA, and establishes long-term goals for protection and use of the California Desert.

The need for action is to consider whether the CDCA Plan should be amended to make the HGLA, or portions thereof,

- Available to geothermal leasing with standard terms and conditions
- Available to geothermal leasing with additional stipulations or
- Unavailable.

The HGLA is located on land designated as multiple use class L – limited use land. Geothermal facilities may only be permitted on Class L land when specific NEPA requirements are met and the lands are identified as available for geothermal leasing. Currently, the CDCA Plan requires that projects for power generation or transmission, not already identified in the plan, be considered through the plan amendment process. As part of this planning process, the BLM would consider whether to amend the plan to allow projects for geothermal power generation, or transmission, in the HGLA following receipt of an acceptable plan of development and site specific analysis under NEPA. Should the HGLA, or some portion, be identified as available to geothermal leasing under the CDCA Plan, then any subsequent geothermal lease located within the HGLA would not require a site-specific plan amendment.

1.3 BLM AUTHORIZATIONS

The Geothermal Steam Act of 1970 (84 Stat, 1566; 30 U.S.C. 1001-1025), as amended by the Energy Policy Act of 2005, provides the Secretary of the Interior with the authority to lease public and federal lands for geothermal exploration and development in an environmentally sound manner. New federal geothermal development regulations (43 CFR Parts 3000, 3200, and 3280-Geothermal Resource Leasing and Geothermal Resources Unit Agreements) became effective June 1, 2007. It is the policy of the federal government, consistent with Section 2 of the Mining and Mineral Policy Act of 1970 and Sections 102(a)(7), (8), and (12) of the FLPMA of 1976, to encourage the development of mineral resources, including geothermal resources, on federal lands. The BLM has been delegated the authority to issue geothermal leases and implement the Geothermal Steam Act through the regulations contained in 43 CFR Part 3200.

1.3.1 Regulatory Framework

The BLM considers competitive geothermal energy leases under the Geothermal Steam Act of 1970, as amended (30 United States Code [U.S.C.] 1001-1025) and the Energy Policy Act of 2005 (Public Law [Pub. L.] 109-58). Lands for geothermal energy development, which are nominated for leasing by geothermal developers, must first be identified as suitable for these purposes in a land-use plan prepared according to Section 202 of FLPMA.

1.3.1.1 Leasing Geothermal Resources

Geothermal resources are underground reservoirs of heat. This heat is generated from natural sources within the earth and can create or be used to produce hot water or steam. Natural geothermal steam and hot water can reach the surface of the earth in the form of hot springs, geysers, mud pots, or steam vents. Geothermal heat can also be accessed by wells, and that heat energy can be transferred to generate electricity or for other direct uses such as heating greenhouses and aquaculture operations.

On May 2, 2007, the BLM issued new regulations governing geothermal resources (Federal Register [FR], May 2, 2007, Volume 72, Number 84, Part II). The new rule stated that State Offices that received nominations or expressions of interest filed before August 8, 2005, (the "date of enactment" of the Energy Policy Act), may offer those lands, if available, for competitive leasing under the revised geothermal regulations. Instructional Memorandum (IM) 2009-022, issued on October 9, 2009, provided additional guidance on implementing the new rule. 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 so 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 3206.17 and 3208.10). 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 40 years (43 CFR 3207.10), with a right of renewal for up to another 40 years (43 CFR 3207.11). 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 (BLM 2002).

All of the federal lands within the HGLA which may be considered for geothermal leasing under this EIS may include the following special stipulation (SA-HGLA-2) requiring unitization to protect the federal interest, to prevent waste and to limit the environmental impacts of geothermal exploration and development activities (*43 CFR 3280.4*):

> *UNITIZATION STIPULATION The lessee shall fully commit the lease to a geothermal unit acceptable to the Bureau of Land Management within 6 months of the effective date of the lease. Failure to commit the lease to a geothermal unit acceptable to the Bureau of Land Management shall subject the lease to cancellation.*

A comprehensive list of the stipulations which may be applied to newly issued geothermal leases is included in Section 2.6.

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. 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 the BLM for exploring for the geothermal resource based upon the geology, not the land status. It also avoids the situation where each 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 on both surface and subsurface resources. Since unitization can and does reduce the overall impacts on a given area under lease, a requirement for the federal geothermal lessees to unitize their interests can be considered an effective tool to help mitigate the potential impact on surface uses, including recreational use.

Certain lands are designated as known geothermal resource areas (KGRAs) and are offered only through a competitive bid process. KGRAs are areas with a competitive interest in geothermal resource development and where the BLM has identified, via geologic and technical evidence, as capable of commercial production of geothermal fluids. There is no single criterion for KGRA designation. The intent of the competitive lease approach is to allow the public to receive a market value for leasing the right to develop these resources. Until the passage of the Energy Policy Act, lands outside KGRAs could be leased noncompetitively. Some of the lands within the HGLA were not within a KGRA at that time and were open to noncompetitive leasing up until the passage of the Energy Policy Act.

The pending lease applications within the HGLA were filed prior to the Energy Policy Act, and are therefore considered to be noncompetitive applications.
Section 222 of the Energy Policy Act modified the Geothermal Steam Act to require competitive lease sales for federal geothermal resources. Noncompetitive leases would be allowed for tracts that do not receive bids in a competitive lease sale. Under 43 CFR 3202.10:

(a) BLM may issue (geothermal) 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 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.

Lands that are not available for leasing are identified in 43 CFR 3201.11 as follows:

(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;

(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 HGLA were closed to geothermal leasing or solar or wind ROW grant applications in the CDCA Plan. The analysis in this 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 that is used for analysis in this EIS.

1.4 NEPA, FLPMA, AND CDCA PLAN

1.4.1 National Environmental Policy Act (NEPA) of 1969

The NEPA requires federal agencies to review the effects of its "major federal actions" on the natural and human-made environment prior to taking action. The review process helps both federal officials and the public understand the environmental consequences of all major projects and actions including those 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.

1.4.2 Federal Land Policy and Management Act (FLPMA) of 1976

The FLPMA mandates that multiple use and sustained yield principles govern the management of public lands. The FLPMA provides the BLM's overarching mandate to manage the public lands and resources under its stewardship. Multiple Use is the 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 is 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)).

1.4.3 California Desert Conservation Area (CDCA) Plan (1980), as Amended

The HGLA is located within the BLM's Multiple Use Class (MUC) "Class L" lands. MUC Class L lands protect sensitive, natural, scenic, ecological, and cultural resource values and are "managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished." However, it is important to note that, for MUC Class L lands, geothermal electrical generation facilities may be allowed pursuant to licenses issued under 43 CFR Section 3273 (Geothermal Resource Leasing), as long as all applicable NEPA requirements are met (CDCA Plan, page 90).

The CDCA Plan also designated major Energy Production and Utility Corridors to consolidate compatible rights of way, avoid sensitive resources, site ongoing projects for which decisions have been made, and site future transmission lines (CDCA Plan, Map 16). One goal of this element of the plan is to identify potential sites for geothermal development. Another goal is to fully implement use of transmission corridors to meet utility demand. Utility Corridor A runs north and south along existing transmission lines on the east side and adjacent to U.S. Highway 395 (US 395), and contains a 500 kV, 230 kV, and 138 kV transmission line. In 1984, the CDCA Plan was amended to establish a second one-mile wide, five-mile long corridor that runs generally east to west and serves to connect the Coso Known Geothermal Resource Area with Utility Corridor A. This corridor currently includes a 115 kV transmission line and a buried telephone cable line (BLM California Serial Numbers CACA 13510 and CACA 18885) that were previously authorized to the California Energy Commission, and subsequently assigned to Coso Power Developers, Coso Finance Partners, and Coso Energy Developers. The identification of geothermal potential in the HGLA and the development of any resource that may be found there, meets CDCA Plan goals.

The CDCA Plan also includes a Geology-Energy-Minerals (G-E-M) resource element, which defines the following goals for G-E-M resources:

- 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, G-E-M database, and professional, technical, and managerial staff knowledgeable in mineral exploration and development.

Specific objectives of the G-E-M element are:

- To 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 United States imports 50 percent or more, and minerals of which the United States is a net exporter.
- To 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.

1.5 OTHER APPLICABLE LAWS, PLANS, AND PROGRAMS

1.5.1 State of California Renewable Portfolio Standard Program

Renewable portfolio standards are state laws requiring electric utility providers to obtain a minimum percentage of their energy from renewable generation sources such as geothermal, wind, solar, hydroelectric, biomass and tidal. Although future geothermal developments in the HGLA would represent a federal action taking place on federal land, the development of geothermal resources in the HGLA would also assist the State of California with its Renewable Portfolio Standard goals that, according to Executive Order S-14-08, call for 33 percent of California's energy to be derived from renewable sources by the year 2020.

1.5.2 Geothermal Steam Act of 1970, as Amended

The Geothermal Steam Act, as amended, governs the leasing of geothermal steam and related resources on public lands (30 USC §1001 et seq.). This Act authorizes the Secretary of the Interior to issue leases for development of geothermal resources, and also prohibits leasing on a variety of public lands, such as those administered by the U.S. Fish and Wildlife Service.

1.5.3 Mining and Minerals Policy Act of 1970

Section 2 of the Mining and Mineral Policy Act of 1970 formally recognized the importance of mining and domestic minerals production as a policy of the United States. It encouraged the development of mineral resources, including geothermal resources, on federal lands.

1.5.4 West Mojave (WEMO) Plan

The WEMO Plan covers 9.3 million acres of land including 3.4 million acres of public lands, three million acres of privately owned lands, and the balance owned by the Department of Defense. The WEMO Plan amended the CDCA Plan in June 2006.

Among other things, the WEMO Plan designated the Mojave Ground Squirrel Conservation Area (MGSCA). The HGLA falls entirely within the designated MGSCA. New ground disturbance within the MGSCA is limited to one percent (1%) of existing habitat (WEMO, 2006). New ground disturbance includes any clearing; excavating, grading, or other manipulation of the terrain on BLM administered land and which occurs after adoption of the WEMO Plan. The BLM established a jurisdictional threshold of 10,387 acres of allowable ground disturbance on BLM administered land for the 30-year term of the WEMO Plan.

1.5.5 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. The Energy Policy Act 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 this EIS.

1.5.6 Clean Air Act

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

1.5.7 Clean Water Act

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

1.5.8 Endangered Species Act of 1973

The Endangered Species Act of 1973, as amended, provides for the federal protection of threatened and endangered plants and animals. The U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration administer the Endangered Species Act. 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, and (4) provisions for permits to allow the incidental taking of threatened and endangered species.

1.5.9 National Historic Preservation Act of 1966

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), which includes 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 any undertakings, including the proposed action considered here, on listed or eligible historic resources on the NRHP. It also affords the State Historic Preservation Office and the Advisory Council on Historic Preservation an opportunity to comment regarding the proposed action. The NRHP eligibility criteria have been defined by the Secretary of the Interior's Standards for Evaluation (36 CFR 60).

1.5.10 Programmatic EIS for Geothermal Leasing in the Western United States (2008)

In October 2008, the BLM published the Final Programmatic EIS for Geothermal Leasing in the Western United States. It addressed geothermal leasing on lands administered by the BLM and the USFS in twelve western states including Alaska. Specific to the BLM, the Record of Decision of the Final Programmatic EIS approved the BLM's decision to facilitate geothermal leasing of the federal mineral estate in these 12 western states. This decision: (1) allocates BLM lands as open to be considered for geothermal leasing or closed for geothermal leasing (2) develops a reasonably foreseeable development scenario that indicates a potential for 12,210 MW of electrical generating capacity from 244 power plants by 2025; plus additional direct uses of geothermal resources, and (3) adopts stipulations, BMPs, and procedures for geothermal leasing and development on BLM-administered lands.

The HGLA was not analyzed in the 2008 Final Programmatic EIS for Geothermal Leasing in the Western United States; however, many of the relevant stipulations and BMPs within the Final Programmatic EIS have been incorporated into the analyses within the HGLA EIS so that they become elements of the CDCA plan through this plan amendment process.

1.5.11 Coso Junction PM_{10} State Implementation Plan

The HGLA is located within the Coso Junction PM_{10} planning area, which falls under the jurisdiction of the Great Basin Unified Air Pollution Control District (GBUAPCD). The GBUAPCD regulates stationary sources of air emissions in the HGLA. Stationary sources, such as geothermal plants that have the potential to emit pollutants into the air, are subject to the rules and regulations adopted by the GBUAPCD.

As part of the PM_{10} attainment planning process, the GBUAPCD has adopted the State Implementation Plan (SIP) for the Coso Junction PM_{10} Planning Area (GBUAPCD 2004). The SIP indicated that attainment of the PM_{10} standard for the Coso Junction area is dependent on emission reductions in Owens Valley.

Within the Coso Junction area of the Great Basin Valleys Air Basin, which occupies the same area as the GBUAPCD, if net annual emissions of PM_{10} increase by less than 100 tons, a California Air Act (CAA) conformity determination is not required. Within the Owens Valley area, the *de minimis* threshold for PM_{10} is 70 tons per year because the area is classified as a serious nonattainment area for PM_{10}. If emissions of PM_{10} in these areas exceed the *de minimis* threshold, the BLM must demonstrate conformity under one of the methods prescribed by GBUAPCD Regulation 13.

The Coso Junction area is considered an unclassified/attainment area for ozone and hydrogen sulfide (H_2S). As such, a CAA conformity determination would not be required for sources of ozone precursors or sources of H_2S. As discussed above, the developers of new stationary sources of air emissions must consult and coordinate with the GBUAPCD to obtain the necessary permits to construct and operate a facility, and must comply with applicable rules and regulations.

1.5.12 Inyo County General Plan

The Inyo County General Plan is a comprehensive land use plan that provides the county with a consistent framework for land use decision making. The plan covers the following elements: land use, circulation, housing, conservation, open-space, noise, safety, government, and economic development. Geothermal energy development is addressed in one of the Plan's nine elements; Conservation/Open Space Element.

The 2001 Inyo County General Plan Update was approved by the Inyo County Board of Supervisors on December 11, 2001. State law requires each county and city to prepare and adopt a comprehensive and long-range general plan for its physical development (Government Code Section 65300). A comprehensive general plan provides the County with a consistent framework for land use decision-making. All alternatives in the Haiwee Geothermal Leasing Area Draft Environmental Impact Statement and Draft Plan Amendment are consistent with the 2001 Inyo County General Plan.

1.5.13 Inyo County Water Policy

State law does not regulate groundwater management, but allows local governmental entities the latitude to regulate this resource as needed. The Inyo County Board of Supervisors adopted the Water Policy (Resolution 99-43) in July 1999 (replacing earlier water policies).

This policy established the Inyo County Water Commission and the Inyo County Water Department to regulate water resources within the county. These entities were created principally to regulate the relationship between the county and the Los Angeles Department of Water and Power.

"That policy is to protect the County's environment, citizens and economy from adverse effects caused by activities relating to the extraction and use of water resources and to seek mitigation of any existing or future adverse effects resulting from such activities."

All alternatives in the HGLA draft EIS and Draft Plan Amendment are consistent with Inyo County's policy on the extraction and use of water.

1.6 ISSUES CONSIDERED BUT NOT ANALYZED FURTHER

1.6.1 Wilderness Inventory

All Public Lands within the CDD were analyzed and summarized in 1979 wilderness inventory decisions performed pursuant to FLPMA. See *"California Desert Conservation Area - Wilderness Inventory –Final Descriptive– March 31, 1979".*

The wilderness inventory for the relevant portions of the three WIUs were maintained pursuant to section 201[a] of the FLPMA. Conditions existing in 2011 have not changed substantially since 1979. Mining activity and associated roads are even more extensive, and several new BLM authorized rights of way for new facilities have created additional impacts on the naturalness of the area. In summary, no changes have occurred since 1979 that would warrant reversal of the 1979 decision that wilderness characteristics were not present in the project area; therefore, wilderness characteristics will not be analyzed further. In reaching this conclusion BLM considered the following:

- The HGLA includes approximately 38 sections in four townships and contains geothermal applications CACA 043993, 043998, and 44082. Public Land in the HGLA overlaps CDCA Wilderness Original Inventory Units [hereafter WIU] #CDCA 131, 133, 157B, and several unnumbered WIUs along the Highway 395 corridor.

- WIU #CDCA 133 is entirely within T 21S R38E MDM and overlaps the southeast portion of the HGLA. The area is bounded by roads and on the south and east by the China Lake Naval Air Weapons Station [CLNAWS]. WIU 157B is west of Highway 395 and the eastern boundary is the railroad. The 1979 decisions were that the Public Land in these two WIUs was not of sufficient size as to make practicable their preservation and use in an unimpaired condition. Also several unnumbered WIUs lie along the Highway 395 corridor. It was determined that they did not contain wilderness characteristics. The eastern boundaries of both WIUs 157 and 157A are the western aqueduct road, and as such, neither overlaps the project area.

- WIU #CDCA 132 is very large and extends almost 40 miles north to south. The northwestern boundary is Highway 190, the western is the access road for power lines along Highway 395, the eastern boundary, except for WIU 133, is CLNAWS, and the northeastern boundary are roads south of Highway 190. The Coso Range Wilderness was designated in 1994 and is in the northeast portion of the WIU. The portion of the WIU south of the Coso Range Wilderness has four distinct topographic components. From north to south they are: the southern half of Cactus and McCloud Flats, a mountain range on the east side of Haiwee Reservoir extending 12 miles southeast into CLNAWS, a southwest trending bajada from those mountains crossing Highway 395 and extending four miles north and south of Coso Junction, and a two mile wide triangular strip west of CLNAWS and east of the power line and Highway 395.

- The HGLA overlaps the southern end of the mountainous terrain and the bajada in the vicinity of Coso Junction. The 1979 analysis determined that the numerous mines in the mountainous area and associated roads and trails across the bajada and in the mountains were substantially noticeable imprints of man. As such, this portion of WIU #CDCA 132 was determined not to have wilderness character.

1.6.2 Executive Order No. 6206

Executive Order No. 6206 (EO 6206) was issued on July 1933, under authority of the Picket Act of 1910, to withdraw lands from "settlement, location, sale, or entry" … "for the protection of the water supply of the City of Los Angeles." Lands within the HGLA that are identified as withdrawn in EO 6206 include:

Mount Diablo Meridian,
T. 21 S., R. 37 E.,
sec. 11, Unsurveyed Protracted Blocks 41 and 42, sec 14, lot 1 to 3, inclusive, 5 to 11, inclusive, NE1/4NE1/4, NE1/4NW1/4, W1/2SW1/4, SE1/4SW1/4, SE1/4SE1/4;
sec. 23,S1/2S1/2, Unsurveyed Protracted Block 45 , 25, sec. 26, E1/2E1/2, sec. 35.

Mount Diablo Meridian,
T. 22 S., R. 37 E.,
sec. 1, All;
sec. 2, All;
sec. 11, All;

sec. 12. All;

Mount Diablo Meridian,
T. 21 S., R. 38 E.,
sec. 17, S1/2;
sec. 18, All;
sec. 19, All;
sec. 20, All;
sec. 21, All;
sec. 27, All;
sec. 28, All;
sec. 29, All;
sec. 30, All;
sec. 31 All;
sec. 32, All;
sec. 33 All;,
sec. 34, All;

Mount Diablo Meridian,
T. 22 S., R. 38 E.,
sec. 5, All;
sec. 6, All;
sec. 7, All;
sec. 8, All;

EO 6206, including subsequent amendments and applicable rulings, does not preclude geothermal leasing of these lands, nor any planned water use that is consistent with protecting the water supply of the City of Los Angeles.

THIS PAGE INTENTIONALLY LEFT BLANK.

CHAPTER 2

ALTERNATIVES

INCLUDING

THE

PROPOSED ACTION

THIS PAGE INTENTIONALLY LEFT BLANK.

TABLE OF CONTENTS

CHAPTER 2 ALTERNATIVES

TABLES:

FIGURES:

THIS PAGE INTENTIONALLY LEFT BLANK.

CHAPTER 2 ALTERNATIVES

2.1 INTRODUCTION

There are two decisions to be made on the basis of this National Environmental Policy Act (NEPA) analysis of the Bureau of Land Management's (BLM) Haiwee Geothermal Leasing Area (HGLA) geothermal exploration and development program. The first involves whether or not to amend the California Desert Conservation Area (CDCA) Plan, and if so, how it should be done. The second decision is whether or not to issue one or more of the three pending geothermal leases. These decisions are contingent upon evaluation of the HGLA as to its suitability for geothermal exploration and development. Following public input, nine general alternatives were developed and evaluated. The fully analyzed alternatives address decision outcomes that include amending the CDCA and issuing the leases. These alternatives are:

Fully analyzed alternatives:

Alternative A: Open the entire HGLA for geothermal exploration, development and leasing; amend the CDCA Plan to have the HGLA open and available for geothermal exploration, development and leasing; authorize all pending leases within the HGLA.

Alternative B: Close the entire HGLA to geothermal exploration, development and leasing; amend the CDCA Plan to have the HGLA closed and unavailable for geothermal exploration, development and leasing; deny authorization of all pending leases within the HGLA.

Alternative C: Open the HGLA to geothermal exploration, development and leasing; with no surface occupancy (NSO) allowed in sensitive areas; amend the CDCA Plan to have the HGLA open and available for geothermal leasing; authorize all pending leases within the HGLA. (Preferred Alternative)

Alternative D: Selective closure of sensitive resource areas within the HGLA for geothermal exploration and development; amend the CDCA Plan to have designated areas within the HGLA open and available for geothermal leasing; amend the CDCA Plan to have designated areas within the HGLA closed and unavailable for geothermal leasing; authorize all pending leases within the HGLA.

Alternative E: No action; the area would remain under current management as specified in the CDCA Plan; deny authorization of all pending leases within the HGLA.

Alternatives considered but not fully analyzed (also see section 2.4):

- Alternative Technologies for Power Generation
- Energy Conservation and Demand Side Management
- Alternative Geothermal Technologies
- Alternative Sites

This chapter evaluates each alternative's potential to meet the BLM's purpose and need for the HGLA. The alternatives were developed in response to the issues, concerns, and opportunities identified at public scoping meetings, in collaboration with interested agencies, organizations, and stakeholders, and in evaluations between BLM interdisciplinary resource specialists. Figure 2.1-1 *Land Status* provides additional context for understanding the alternatives being proposed.

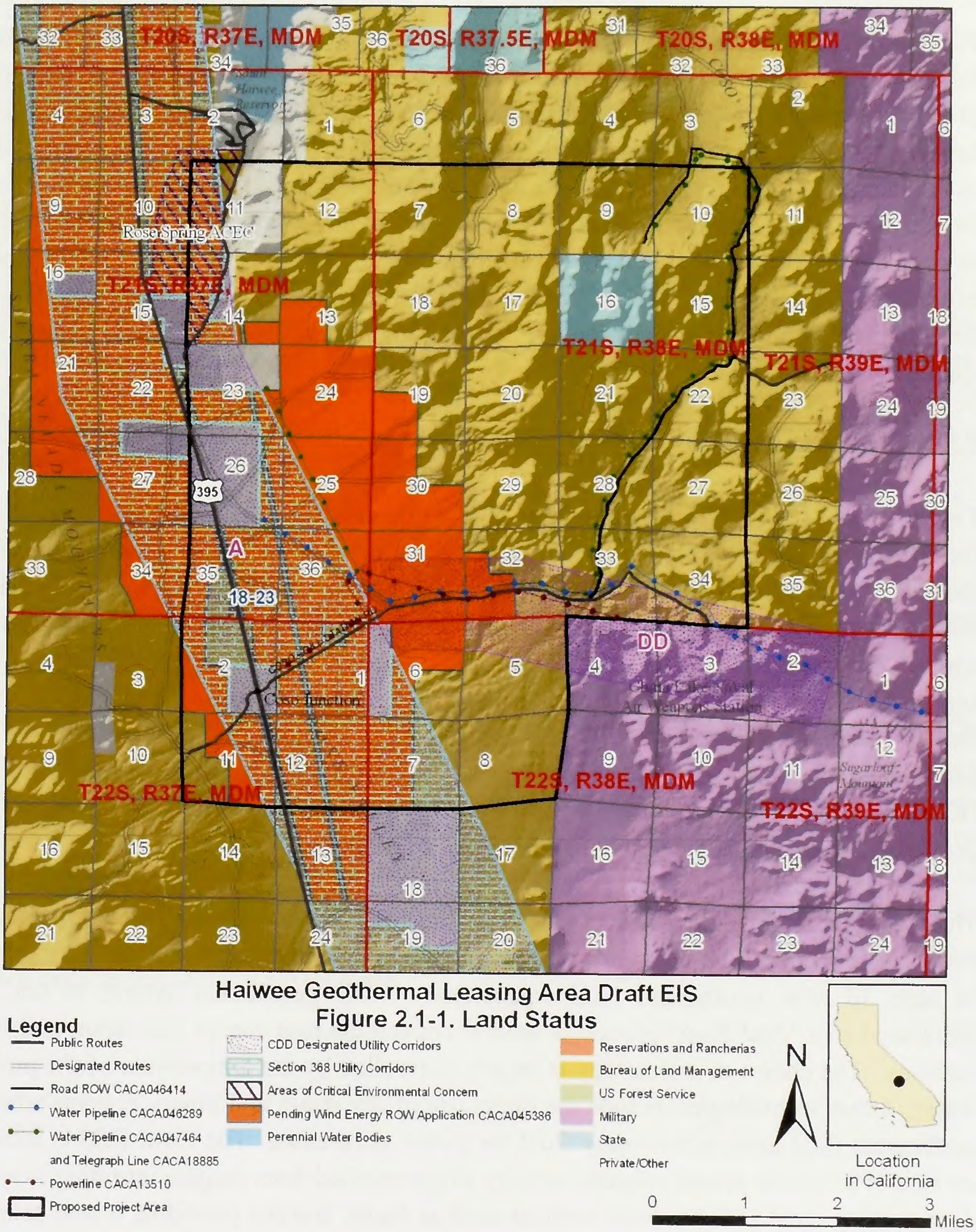
Following the discussion of the fully analyzed alternatives, the alternatives considered but eliminated are discussed. Four alternatives were considered but eliminated from full analysis because they do not meet the purpose of and need for action.

This chapter also contains a detailed discussion of the Reasonably Foreseeable Development (RFD) scenario developed by the BLM. The RFD is used in Chapter 4 as a basis to identify potential impacts associated with each of the action alternatives (A, B, C, or D).

Three alternatives open the HGLA to geothermal leasing and development (A, C, and D). Alternative B closes the HGLA to leasing and development. The No Action Alternative (E) is required under the National Environmental Policy Act (NEPA) and implementing Council of Environmental Quality (CEQ) regulations (40 CFR 1500-1508).

Alternatives A, C, and D share many common elements. To different degrees, all would result in finding some portion of the HGLA suitable for geothermal exploration and development, and requirements such as protection of Mojave ground squirrel and desert tortoise habitat would apply. The RFD scenario is the same for alternatives A, C and D. Other resource protection measures, including the stipulations and best management practices (BMPs) described in this chapter, also apply to alternatives A, C, and D.

FIGURE 2.2-1 **Land Status**



2.2 GEOTHERMAL GENERATION FACILITY DESCRIPTION: REASONABLY FORESEEABLE DEVELOPMENT (RFD) SCENARIO

The following section describes on-the-ground activities for each phase of reasonably foreseeable geothermal power development. As discussed in Chapter 1, the issuance of geothermal leases confers on the lessee a restricted or limited right to 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 is authorized, the BLM will conduct additional site and project specific environmental analysis to determine any additional conditions that may be required to facilitate further project specific exploration, development, and utilization of geothermal resources. Any exploration or development authorization shall include appropriate site and project specific conditions of approval.

2.2.1 Background

Twenty-four of the 38 sections in the HGLA boundaries are within the Coso Known Geothermal Resource Area (KGRA). Figure 2.2-1 illustrates the spatial relationship between these two areas and the development at the Coso geothermal field. HGLA lands that are outside of the KGRA are strikingly similar in geology to lands within the KGRA and have similar mineralogy, lithology, and structure. Numerous technical papers and geologic analyses have documented the similarities in geologic setting between the two areas.[1] While there is no direct data available to validate this RFD scenario, the proximity to the Coso geothermal operations and the KGRA suggests the possibility of a similar resource within the HGLA. The RFD is largely based on the HGLA being in the vicinity of the active Coso geothermal field and the ongoing operations that occur there.

The Coso geothermal field has produced as much as 273 megawatts (MW) of electricity since construction. This field currently produces less than that initial maximum from a total of nine 30 MW geothermal turbine/generators. The geothermal system is hot water dominated so a "dual flash" process is used to convert the heat energy into steam to drive the turbines. The choice of technology is largely controlled by the temperature of the produced water. Other technologies include the direct use of dry steam and binary systems where the geothermal fluid heats a secondary fluid for power generation. The Coso field is located in an area of relatively recent volcanic activity which resulted from magma intruding to shallow depths along localized structural controls such as faults, thereby providing a heat source for the geothermal field.

[1]Duffield, et al., 1980, Jackson & O'Donnell, 1980, Wohletz and Heiken, 1992, etc.

The Coso geothermal field is used as an analog for what may be found in the HGLA. Unlike Coso, there is an absence in the HGLA, of surface features associated with geothermal activity such as hot springs and fumaroles. Based on this observation, it is assumed that any resource, should one be located, would be deeper than at Coso and less economically viable. Therefore the RFD assumes that only two 30 MW "dual flash" power plants would be constructed with a useful life of 30 years. The foreseeable development described could occur on any land in the HGLA regardless of surface or mineral ownership.

2.2.2 Exploration Activities

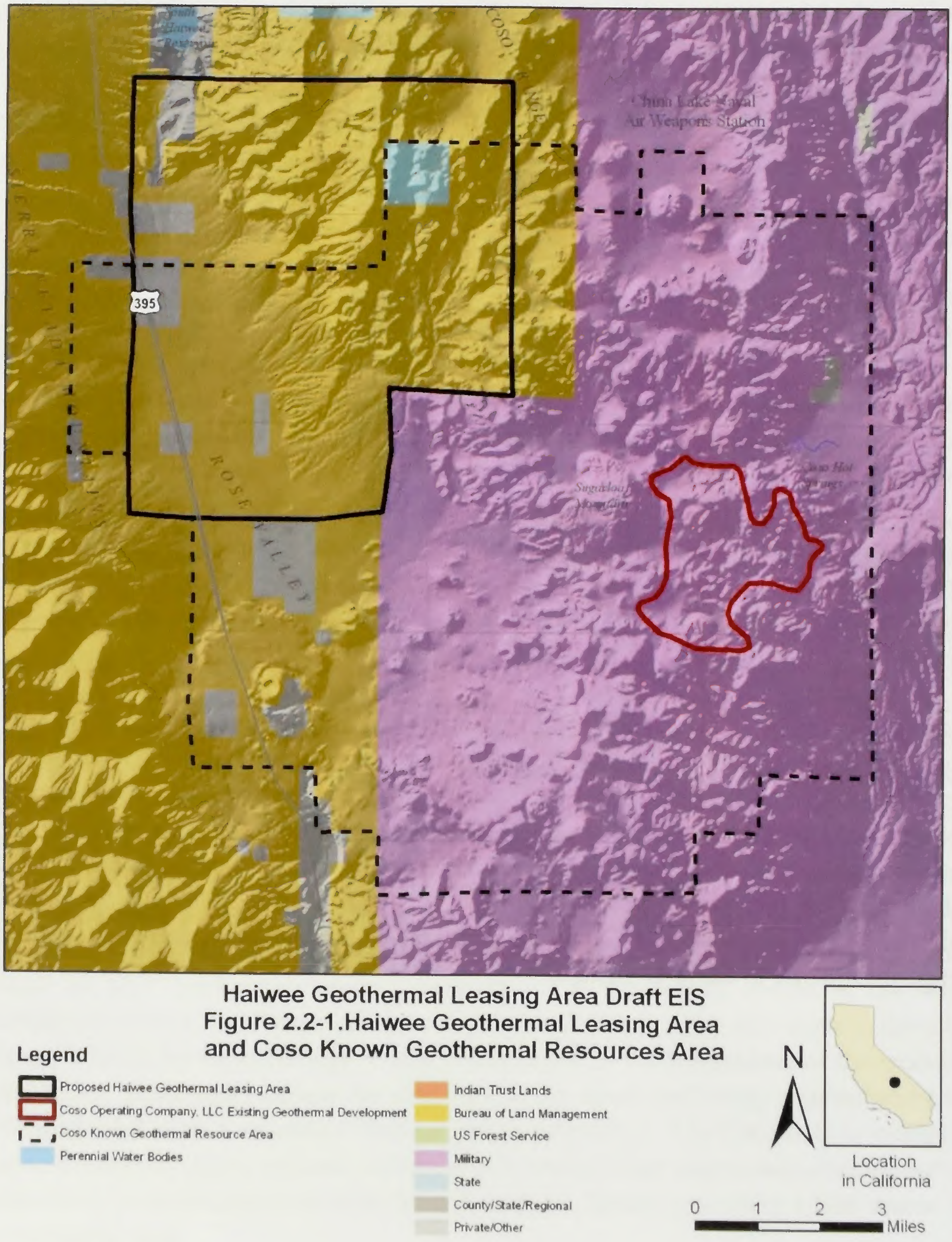
For exploration activities within an area open to geothermal leasing, an operator must file an exploration application with the BLM that identifies the areas to be explored and the method of exploration. The proposal identified in the application undergoes NEPA and other appropriate environmental review. The BLM may, depending upon the results of the analysis undertaken during this review, approve, reject, or modify the project requested in the application.

Exploration is expected to include some geophysical exploration such as seismic reflection / refraction testing[2], and other forms of (low impact) surface geophysical testing. Up to 20 temporary exploration, or temperature gradient wells (TGW), could also be expected with full development of this RFD.

Geophysical testing can be passive, measuring naturally-occurring events to define subsurface features, or it can involve the observation of artificially induced events. Induced events are created using such tools as mechanical vibrators, called vibroseis, small explosive charges, or electrical generators. Testing typically requires measurement of seismic waves, magnetic fields, or electrical current using receivers stationed at known locations. The size and intensity of the energy measured as it moves through the earth provides a clearer understanding of the subsurface. Geophysical testing is expected to create two acres of total surface disturbance in the RFD scenario.

[2]http://www.geophysics.co.uk/mets3.html

FIGURE 2.2-1 The Haiwee Geothermal Leasing Area (HGLA) and the Coso Known Geothermal Resources Area (KGRA)



TGWs are small diameter, relatively shallow boreholes that do not extend into a geothermal resource or reservoir. The purpose of these wells is to identify areas that have the greatest amount of heat flow. Once identified, these areas could be the targets for additional (slim-hole) exploration wells. It is assumed that the surface disturbance for each of the 20 exploration wells, or TGWs, is three acres. The three acres of disturbance includes a drilling site and an access road. It is likely that some of the drilling locations used for the TGWs may also be used for production well locations. For the purposes of the RFD, however, it was assumed that these would remain separate disturbances.

The total surface disturbance anticipated from exploration is 62 acres. It is assumed that this would be a temporary impact, since the exploration and TGWs will typically be plugged, abandoned, and these well sites, along with the two acres disturbed by geophysical testing, would be reclaimed. If a resource is identified, however, it is understood that, for a period of time, some of the TGWs may be used for observation or monitoring.

2.2.3 Construction Activities

Power plant development is not considered a reasonable foreseeable future activity when analyzing the effects of a geothermal exploration project proposing solely TGWs, flow testing, and limited geophysical testing. For the purpose of this RFD scenario, however, the development phase will occur if an operator locates a viable geothermal reservoir during the exploration phase.

An Operations Plan would be required for drilling of production and injection wells as part of the Geothermal Drilling Permit. A Plan of Development is associated with Unitization and submitted with the Unit Agreement. This operations plan would state how the operator would develop, operate, maintain and decommission a geothermal plant. The plan of development will include a complete description of the construction, operation, and maintenance of infrastructure to capture or harness the geothermal resource; construction of a power plant and installation of transmission lines to distribute generated power; construction of access roads that are able to handle the large-scale equipment used to construct and maintain the facility: and reclamation activities planned after the useful life of the facility. In order to use federal land to produce geothermal power, a Utilization Plan, a Facility Construction Permit, and a Site License must be submitted and approved by BLM. Before commercial operations can begin, a Commercial Use Permit must also be submitted to the BLM and approved.

Each BLM approval of a plan, or permit, requires NEPA and other appropriate environmental review, specific to the newly proposed actions. This further review would evaluate the possible environmental impacts and support decision making by the BLM. The BLM may approve, reject, or modify the proposed project based on the analysis performed during the review. Construction, operation, development, and reclamation activities may impact the environment due to project-related activities. Defining each project's specific boundaries, capacity, and other limitations would occur with the NEPA analysis and subsequent ROW decision for the development application.

2.2.4 Reasonably Foreseeable Development (RFD) Scenario

The BLM has prepared the RFD scenario as a basis for analyzing environmental impacts that have the potential to occur if one of the action alternatives is selected. As the name implies, the level and type of development anticipated in the RFD is a reasonable projection of what could eventually occur if the HGLA is opened to geothermal leasing. It was not intended to be a "maximum-development" scenario; however it is biased towards the higher end of expected development in order to ensure all adverse impacts are identified.

The total surface disturbance to be analyzed within the HGLA as a result of various exploration and construction activities is 384 acres. This total includes 62 acres of temporary disturbance from exploration activities, 202 acres from wells and pipelines, and an additional 120 acres for power plants and transmission. As indicated in the RFD, the total disturbed acreage following restoration of the temporary use areas is approximately 276 acres. The 276 acre footprint represents the maximum potential disturbance that has been analyzed for the operational phase of the geothermal production facilities. Additional surface use restrictions, such as a No Surface Occupancy (NSO) lease stipulation, could result in far fewer surface impacts than have been analyzed.

The HGLA encompasses about 38 sections, or approximately 24,574 acres (including all public and private). Of this, most of the land is BLM-managed surface and subsurface. Of the 24,574 acre leasing area, only about 2,000 acres are non-federal (including one section of California State lands), for a total federal surface land area of about 22,805 acres. Included in the 22,805 acres of BLM-managed lands are the areas subject to the three pending lease applications covering approximately 4,500 acres.

The RFD uses a simple ratio of 93% (22,805 acres BLM/24,574 acres Total) for the number of acres of BLM managed land that could be open to development. That is to say, only 93% of the RFD scenario and impact would be expected to occur on federal lands.

2.2.5 Structures and Facilities

To support each of the two 30 MW geothermal power generation facilities, 15 production wells and seven injection wells would need to be drilled over the course of the estimated 30 year useful life of each power plant. This includes both wells drilled initially, and makeup or replacement wells. For the purposes of this analysis, it is anticipated that five initial production wells will be drilled upon startup and one new production well will be drilled every three years. The initial and replacement wells would be located on up to five new well pads, with each pad large enough to accommodate the drilling of up to five wells. All wells on BLM-managed land will be permitted by the BLM using standard review methods that ensure: 1) protection of ground water; 2) protection of public safety; and 3) that the environment and other valuable resources are not negatively impacted.

Each well has the potential to be from 6,000 feet to 15,000 feet deep. However, these depths should not be considered a limiting factor, since the potential environmental effects are not strongly correlated to the depth of a well, or to the number of wells on a well pad. For example, a 15,000-foot well could be drilled with only slightly more impacts than a 6,000 foot well. The RFD considers the level of impacts associated with the deeper wells, providing a high-development bias, thus eliminating the need to analyze the shallower example. Surface impacts could be further minimized by requiring that multiple wells be drilled from existing single well pad locations. In the case of leases with NSO stipulations, wells would need to be directionally drilled from adjacent lands located outside the area, possibly with additional restrictions to ensure that surface impacts do not occur.

Because the geothermal resource in the HGLA is expected to be relatively deep, directional drilling could be practical and could result in drilling locations that could accommodate multiple wells. In this case, each well pad would require approximately seven acres including cut and fill. As the topography is quite steep in parts of the HGLA, the extent of cut and fill could be important.

Given the rugged topography, each well pad is estimated to need three miles of 30 foot wide access road and one mile of pipeline. It is estimated that half the pipelines will follow the access roads in flatter areas, thereby adding 10 feet to the total width. It is estimated that the other half of the pipelines will be built in rugged areas and would go "cross country". These pipelines would require 30 feet of disturbance initially, but after construction, only a 15-foot access road will remain. Those disturbed acres not used for pipeline access road would be reclaimed to restore native vegetation.

The total foreseeable surface disturbance expected for *each* of the two 30 MW power plants is detailed in Table 2-1. This estimate includes all new well pads, roads, and pipeline corridors associated with the well field needed to supply geothermal resources for ***one*** 30-MW power plant. The expected disturbance would double should two 30-MW power plants be built: 202 acres of temporary disturbance (101 acres x 2 power plants) and then about 194 acres of disturbance (97 acres x 2 power plants) following initial reclamation.

Table 2-1 Approximate Surface Disturbance Associated with Development of New Geothermal Wells for One 30-MW Power Plant

Description	Unit Surface Disturbance (acres)	Number	Total Surface Disturbance (acres)
Well locations	7	5	35
Access roads	3.6 acres/mi	15 miles	54
Flat-land Pipelines	1.2 acres/mi	2.5 miles	3
Rugged-land Pipelines (temporary)	3.6 acres/mi	2.5 miles	9
Rugged-land Pipelines (permanent)	1.8 acres/mi	2.5 miles	5
		Total:	**101 (temporary)** **97 (permanent)**

Each well is expected to take between 90 and 150 days to drill. During this time, high levels of noise could be generated by the diesel engines that power the drilling rigs and air compressors/mud pumps, as well as from the drawworks, drawworks brake, racking of pipe, and well testing. The racking of pipe and drawworks brake are higher pitched noises that typically travel further than sources such as diesel engines. To limit the undesirable effects of light and noise on wildlife, drilling rigs may be required, if analysis warrants, to implement best management practices that are commonly employed in more urban settings. All diesel engines will use mufflers per standard industry practice. All well testing would be done through mufflers to reduce noise. Up to three drilling rigs could be in operation simultaneously and drilling is expected to take place 24 hours a day, seven days per week.

2.2.6 Operations and Maintenance

The Haiwee RFD has assumed that two dual-flash power plants might be constructed to generate steam and electricity on any leases that might be issued within the HGLA. These two plants would be operated and maintained for the duration of the 30-year lease, with a preferential right to renew the license under typical BLM terms and conditions. The RFD scenario for the HGLA anticipated that Dual-flash technology would be used since the nearby Coso geothermal operations are run in that way. That does not preclude a binary process from being the technology of choice. A binary process might be preferable if a resource was identified that had more moderate water temperatures than those currently found in production wells at Coso. The level of surface disturbance is roughly equivalent for both dual-flash and binary technologies. The principal difference between them is that binary systems use relatively less water than dual-flash systems. Other types of geothermal systems are not expected to be identified in this area, and thus were not analyzed.

Each plant location would require about 20 acres, which when added to surface disturbance associated with the well pad would be approximately 25 acres of total surface disturbance including cut and fill. Each plant would also require three miles of access road and four miles of new transmission line to intertie with an existing transmission line that runs through the southwest portion of the HGLA. 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 temporary surface disturbance; however, once the lines are constructed all but a 20 foot access road would be restored with native vegetation.

The total surface disturbance expected to be required for both power plants is detailed in Table 2-2.

Table 2-2 Approximate Surface Disturbance Associated with the Haiwee Power Plant Developments

Description	Unit Surface Disturbance (acres)	Number	Total Surface Disturbance (acres)
Power plant location	25 acres/power plant	2 power plants	50
Access roads	3.6 acres/mi	6 miles	22
Transmission lines – temporary	12.1 acres/mi	4 miles	48
Transmission lines – permanent	2.4 acres/mi	4 miles	10
Total Disturbed Acres – Power Plants:			**120 (temporary)** **82 (permanent)**

2.2.7 Decommissioning and Reclamation

Temporary total disturbance from exploration, development, and operation of two 30 MW geothermal electrical generating facilities is projected to be 384 acres (see discussion above). 353 of these acres (92%) are expected to occur on BLM managed lands. Following initial exploration and development, 108 acres of disturbance is projected to be reclaimed to native conditions. For the 30-year operational life of the facilities, the projected long term disturbance is 276 acres. Of that, 254 acres (92% of 276 acres) is expected to occur on BLM managed lands.

The decommissioning of a facility typically occurs when the energy resource has been depleted. 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. The goal of the completed reclamation is to return the land to its pre-project condition.

2.3 ALTERNATIVES

2.3.1 Alternative A: Open the entire HGLA for geothermal exploration, development and leasing; amend the CDCA Plan to have the HGLA open and available for geothermal exploration, development and leasing; authorize all pending leases within the HGLA.

All BLM administered public lands within the proposed HGLA would be identified as open and available for geothermal exploration, development, and leasing under this alternative. (See Figure 2.3.1-1 Alternative A – Environmental View and Figure 2.3.1-2 Alternative A – Land Status View.)

The three pending geothermal leases located within the HGLA would be authorized, CACA-043998, CACA-044082, and CACA-043993. Approval of a site specific exploration work plan would be required before any ground-disturbing activities could occur.

The CDCA Plan would be amended to classify all land within the HGLA as open and available for geothermal exploration, development, and leasing.

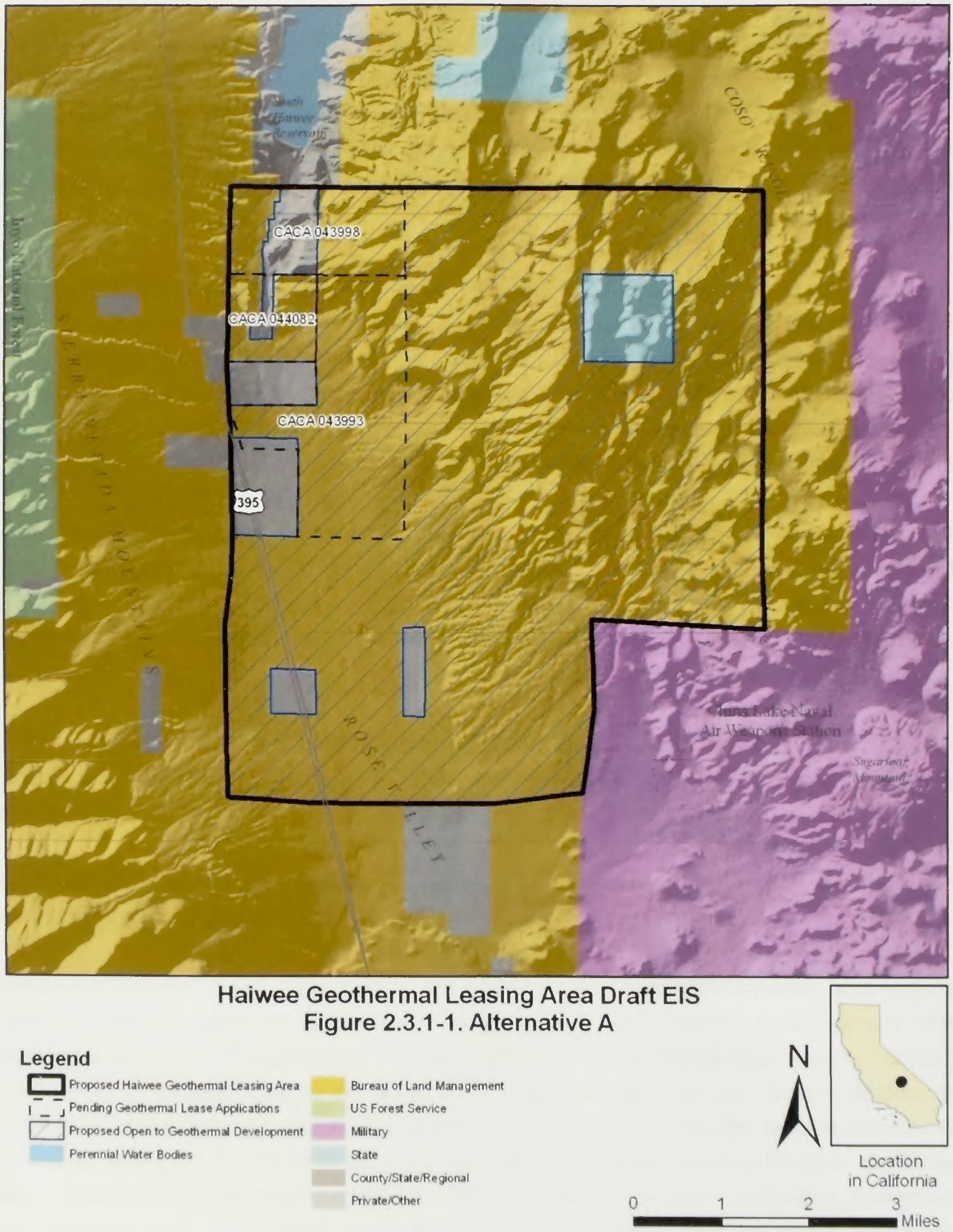
Groundwater extraction for consumptive use during exploration, development, and project operations activities may be allowed for some leasing applications, to the extent that groundwater use, in combination with all other authorized groundwater uses, does not exceed the safe yield or recharge rate to the Rose Valley Aquifer, and does not cause a decline of 10% or more to the average annual fluctuation of water flowing into the surface features at Little Lake, when combined with all other uses that have been approved within the Rose Valley. Special Administrative Stipulation SA-HGLA-10 (see Section 2.6 below), protecting water resources, will be attached to any geothermal leases that would be issued within the HGLA with items SA-HGLA-10a), SA-HGLA-10b), and SA-HGLA-10c) lined out, removed, and not in effect. Groundwater extraction for consumptive use may have other requirements or restrictions to be determined on a project or activity-specific basis.

Should a geothermal resource be identified within the HGLA, compulsory unitization will be expected. Unitization provides for the exploration and development of an entire geologic structure or area by a single operator so that drilling and production may proceed in the most efficient and economic manner. (See BLM Handbook H-3180-1) This would be applied to the entire HGLA, or an appropriate portion, for the purpose of minimizing impacts to the area.

No changes in OHV route designations will be made under this alternative. However, if the BLM receives proposals for exploration or development, changes in route designations may be proposed. Such proposed project specific changes would be analyzed in a subsequent environmental document (EA or EIS) prepared for the proposed exploration or development project. Thus, such changes to route designations, if authorized within the HGLA, may be made without further plan amendment.

Applicable lease stipulations, mitigation measures, and best management practices are detailed in Section 2.6 below.

FIGURE 2.3.1-1 Alternative A



2.3.2 Alternative B: Close the entire HGLA to geothermal exploration, development and leasing; amend the CDCA Plan to have the HGLA closed and unavailable for geothermal exploration, development and leasing; deny authorization of all pending leases within the HGLA.

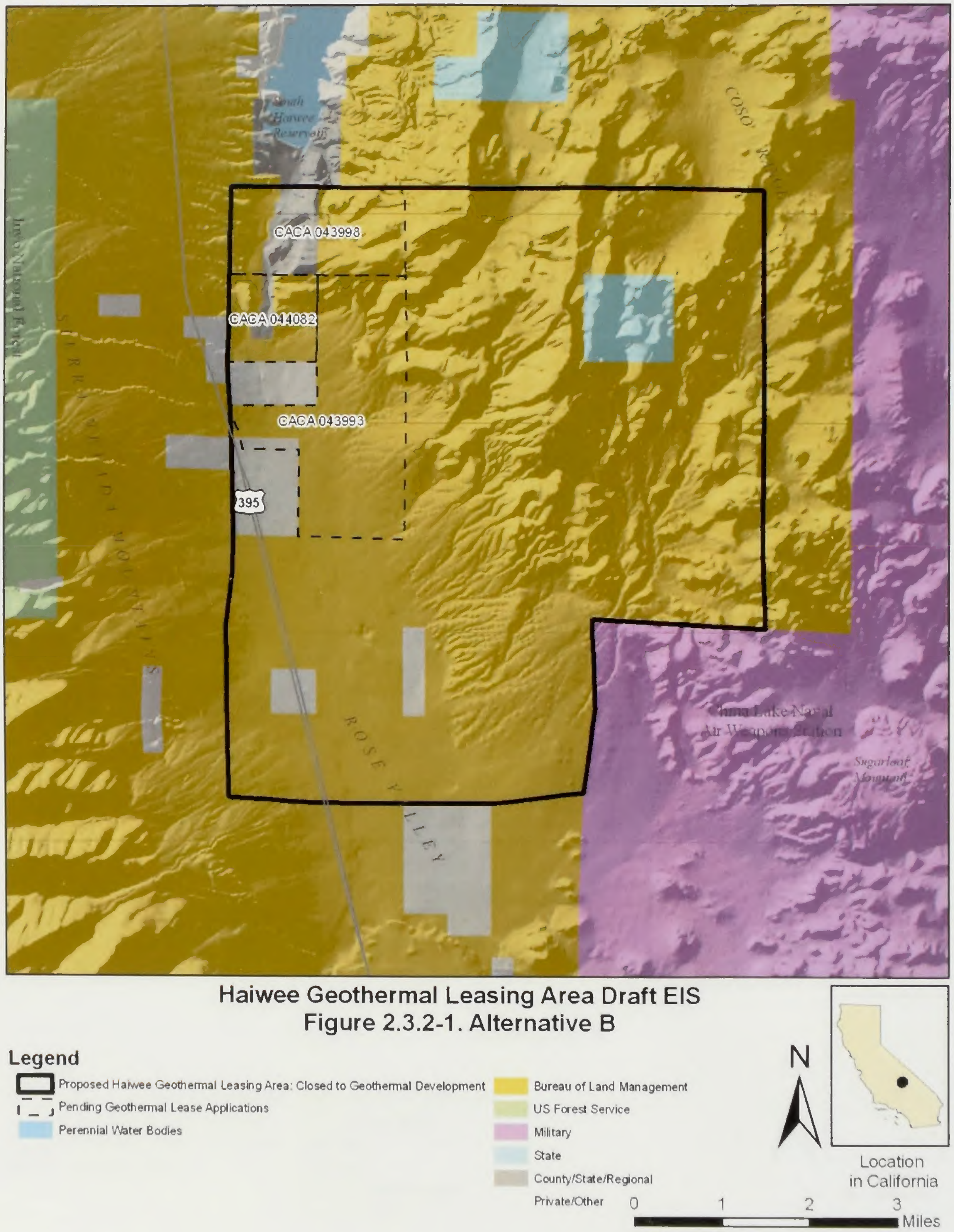
The CDCA Plan would be amended to close the land within the HGLA to geothermal exploration, development, and leasing under this alternative.

BLM administered public lands located within the HGLA would be identified as closed and unavailable to geothermal exploration, development, and leasing.

Therefore, the pending geothermal lease applications, CACA-043998, CACA-044082, and CACA-043993, would be denied.

Alternative B would not affect any OHV route designations.

FIGURE 2.3.2 Alternative B



2.3.3 Alternative C: Open the HGLA to geothermal exploration, development and leasing; with no surface occupancy (NSO) allowed in sensitive areas; amend the CDCA Plan to have the HGLA open and available for geothermal leasing; authorize all pending leases within the HGLA. (Preferred Alternative)

All BLM administered public lands within the proposed HGLA would be identified as open and available for geothermal exploration, development, and leasing under this alternative. (See Figure 2.3.3-1 Alternative C – Environmental View and Figure 2.3.3-2 Alternative C – Land Status View.) Specific acreage within the HGLA would be identified as available for geothermal exploration, development, and leasing, but subject to restrictions to protect sensitive resources. The sensitive resources area is largely expressed by the recognized Mojave ground squirrel core habitat, including its overlay of the Rose Springs ACEC, and is shown on Figure 2.3.3-1 Alternative C – *Haiwee Geothermal Leasing Area – Alternative C, Environmental View*. Resources protected by this restriction include the Mojave Ground Squirrel, the Desert Tortoise, cultural resources, historical resources, and groundwater. This area is expressly defined by the geospatial data file represented in map Figure 2.3.3-1. Any geothermal leases that would be issued within the defined sensitive resources area would include the NSO stipulation NSO-HGLA-1 (see Section 2.6 below). All of the HGLA located outside of the sensitive resources area would be identified as open and available for geothermal exploration, development, and leasing under standard terms and conditions, and including the appropriate lease stipulations from Section 2.6 below.

The three pending geothermal leases located within the HGLA would be authorized: CACA-043998, CACA-044082, and CACA-043993. Approval of a site-specific exploration or development plan would be required before any ground disturbing activities could occur. All surface disturbing activities will be prohibited in areas that are located within the defined sensitive resource area unless they have been authorized by a previous action.

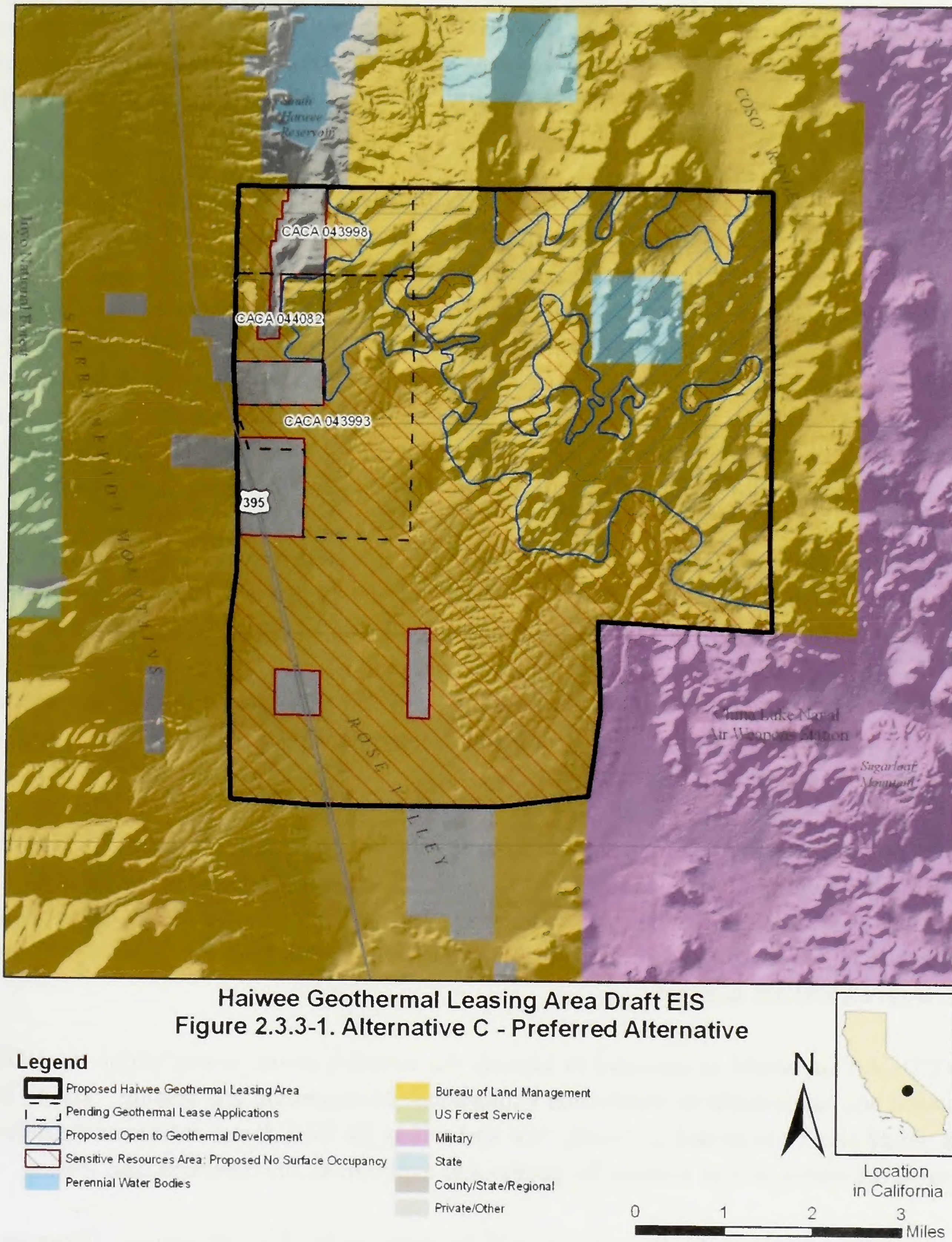
Groundwater extraction for consumptive use will be prohibited or strictly controlled throughout the entire HGLA under Alternative C. Special Administrative Stipulation SA-HGLA-10 (see Section 2.6 below), protecting water resources, will be attached to any geothermal leases that would be issued within the HGLA with item SA-HGLA-10d) lined out, removed, and not in effect.

The CDCA Plan would be amended to find all land within the HGLA as suitable for geothermal exploration, development, and leasing, with the requirement that any geothermal lease issued subsequent to the Final Record of Decision, include Stipulation NSO-HGLA-1 protecting the defined sensitive resources area.

No changes in OHV route designations will be made under this alternative. However, if BLM receives proposals for exploration or development, changes in route designations may be proposed. Such proposed changes would be analyzed in a subsequent environmental document (EA or EIS) prepared for the proposed site specific exploration or development project. Thus, such changes to route designations, if authorized within the HGLA, may be made without further plan amendment.

Applicable lease stipulations, mitigation measures, and best management practices are detailed in Section 2.6 below.

FIGURE 2.3.3-1 Alternative C



2.3.4 Alternative D: Selective closure of sensitive resource areas within the HGLA for geothermal exploration and development; amend the CDCA Plan to have designated areas within the HGLA open and available for geothermal leasing; amend the CDCA Plan to have designated areas within the HGLA closed and unavailable for geothermal leasing; authorize all pending leases within the HGLA.

Specific acreage within the HGLA would be identified as open and available for geothermal exploration, development, and leasing. Other, separate areas within the HGLA would be identified as closed and unavailable for geothermal exploration, development, and leasing in order to protect sensitive resources. The sensitive resource area is largely expressed by the Mojave ground squirrel core habitat, including its overlay of the Rose Springs ACEC, and is shown on Figure 2.3.3-1 – *Alternative D.* This area is expressly defined by the geospatial data file represented in map Figure 2.3.4-1. The area of the HGLA outside of the sensitive resource area would be identified as open and available for geothermal exploration, development, and leasing with surface occupancy. (See Figure 2.3.3-1 – *Alternative D*)

The three pending geothermal leases located within the HGLA would be approved, with modifications so that leases issued would include only lands that are outside of the defined sensitive resources area. The modified pending geothermal leases, CACA-043998, CACA-044082, and CACA-043993 would be approved and authorized. Approval of a site specific exploration or development plan would be required before any ground disturbing activities could occur. To clarify, no lands within the defined sensitive resources area would be authorized for exploration, development, or leasing.

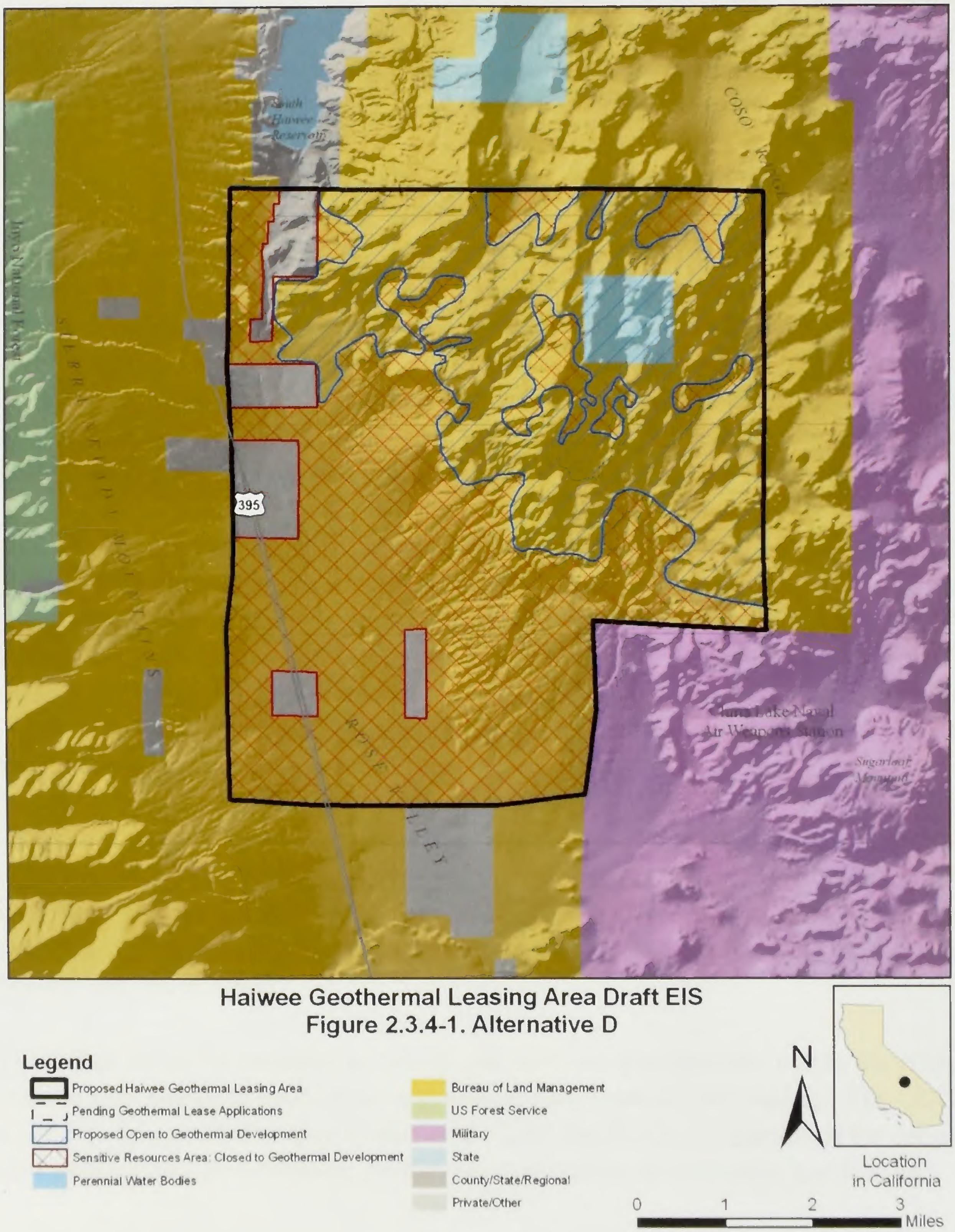
Groundwater extraction for consumptive use will be prohibited or strictly controlled throughout the entire HGLA under Alternative D. Special Administrative Stipulation SA-HGLA-10 (see Section 2.6 below), protecting water resources, will be attached to any geothermal leases that would be issued within the HGLA with item SA-HGLA-10d) lined out, removed, and not in effect.

The CDCA Plan would be amended to identify the sensitive resource area within the HGLA as closed and unavailable to geothermal exploration, development, and leasing. The CDCA Plan would also be amended to classify that land within the HGLA and outside of the defined sensitive resources area as suitable for geothermal exploration, development, and leasing.

No changes in OHV route designations will be made under this alternative. However, if BLM receives proposals for exploration or development, changes in route designations may be proposed. Such proposed changes would be analyzed in a subsequent environmental document (EA or EIS) prepared for the proposed site specific exploration or development project. Thus, such changes to route designations, if authorized within the HGLA, may be made without further plan amendment.

Applicable lease stipulations, mitigation measures, and best management practices are detailed in Section 2.6 below.

FIGURE 2.3.4-1 Alternative D



Haiwee Geothermal Leasing Area Draft EIS
Figure 2.3.4-1. Alternative D

2.3.5 Alternative E: No Action; the area would remain under current management as specified in the CDCA Plan; deny authorization of all pending leases within the HGLA.

This alternative would not change the current management of the BLM administered public lands within the HGLA. This land would remain unclassified in regards to geothermal exploration, development, and leasing. The CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this planning process.

Under Alternative E, all individual applications for geothermal exploration, development, and leasing on lands within the HGLA, including those pending applications, CACA-043998, CACA-044082, and CACA-043993, would be denied. Such denial in this decision-making process would not preclude future consideration of lease issuance in this area.

The No Action alternative would not change any OHV route designations, and would not affect the process for changing route designations in the future.

The No Action Alternative was analyzed to provide a baseline from which to evaluate the other action alternatives in accordance with NEPA and the CEQ regulations (40 CFR 1500-1508).

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED

2.4.1 Alternative Technologies for Power Generation

The BLM has evaluated a number of alternative generation sources, both renewable and fossil-fuel generation, as alternatives to leasing the HGLA for geothermal exploration and possible development. These other generation sources include:

- Solar
    - Solar Thermal
    - Photo Voltaic
    - Distributed Solar
- Wind
- Hydroelectric
- Tidal
- Wave
- Solid Waste

- Biofuels
- Fossil Fuel
  - Coal-Fired
  - Natural Gas
  - Nuclear

Many solar and wind developments are currently proposed throughout the region, and BLM is evaluating the viability of these projects through their application review process and environmental review under NEPA. The HGLA has potential for such developments, and any developments will be evaluated through the BLM's processes once an application for the geographic area is received. Evaluating solar and wind energy was not within the purpose of and need for this action.

Hydroelectric power generation has been developed throughout the western U.S. in viable locations for many decades. The HGLA does not appear to contain adequate resources to develop hydroelectric energy. Tidal and wave generation are also not applicable to the HGLA. Since the sources are not present, these types of generation were not further evaluated.

Solid waste and biofuels are technologies for power generation that are considered viable. BLM may consider this type of energy production in the HGLA if an application is received. Development of these technologies would not meet the purpose of and need for this action, and are therefore eliminated from further consideration.

No coal plants are currently being considered as viable options in California or in most of the western U.S. Gas-fired generation, including simple cycle generation and combined cycle generation, and nuclear power are all viable technologies, however, BLM has not received an application for these technologies within the project area.

The need for action is to allocate specific lands in the HGLA as closed, open, or open with constraints to geothermal leasing (see Alternatives in Figure 2.3.1-1, Figure 2.3.2-1, Figure 2.3.3-1, and Figure 2.3.4-1). All of the technologies discussed above are eliminated from further consideration because they do not meet the need for action. However, if BLM did receive an application for any of these technologies, BLM would further evaluate the proposal under separate NEPA documentation.

2.4.2 Energy Conservation and Demand Side Management

Energy conservation is the more efficient use of electricity by customers. Conservation incentive programs are designed to reduce energy consumption per customer, providing an increase in energy resources for new loads. Load management refers to power supply system improvements by a utility. Load management programs allow customer demand to be moved away from peak load hours, freeing existing resources to serve additional peak loads. These resources are the first used to meet customer electricity demands before constructing new power plants or transmission lines.

Energy conservation and load management programs have the advantage of reducing energy consumption without any documented environmental impacts. They have also lowered utility forecasts of electric energy sales and system peak demand. Each utility has its own programs for energy conservation and demand side management, but typically include weatherization programs, efficient lighting, irrigation retrofitting, electrical generation efficiency improvements, appliance replacement programs, commercial and industrial load management, streetlight conversion, voltage reductions, meter conversions and upgrades, to existing appliances such as water heaters.

Though energy conservation and load management can somewhat reduce energy consumption, they affect energy use and system reliability on a local rather than a regional basis. Therefore, energy conservation and demand side management cannot be considered an alternative action to meet the stated purpose of and need for the proposed leasing action. For this reason energy conservation plans were eliminated from further consideration.

2.4.3 Alternative Geothermal Technologies

The determination for size and type of geothermal generating plant design is based on the geothermal resource characteristics—temperature, pressure, volumes of fluid produced, and chemical properties of the geothermal reservoir. The Haiwee RFD is based on a dual flash geothermal generating plant design utilizing wet cooling towers for steam condensation. This design is based on the assumption that the anticipated temperatures of the Haiwee geothermal resources are comparable to those of the Coso Known Geothermal Resource Area (KGRA), located approximately three miles to the southeast and with similar geologic formations. The Coso geothermal generating facilities employ dual flash plant designs with wet cooling towers. As an alternative, the BLM also evaluated a number of other plant design options such as binary and dry steam plants as well as dry cooling towers. The dry steam power plant was eliminated, because the dry steam reservoirs are rare and not anticipated to occur in the leasing area.

2.4.3.1 Binary Plant

A binary geothermal power plant utilizes comparatively low-temperature (190 to 330 degrees Fahrenheit) hydrothermal resources. The geothermal fluid (which can be either hot water, steam, or a mixture of the two) heats a "working fluid" (such as isopentane or isobutene) that boils at a lower temperature than water. The two liquids are kept completely separate through the use of a heat exchanger, which transfers the heat energy from the geothermal water to the working fluid. When heated, the working fluid vaporizes into gas, and like steam, the force of the expanding gas turns the steam turbines that power the generators. All the process water is injected back into the underground geothermal reservoir.

The binary plant design was eliminated from further analysis because it utilizes lower temperature geothermal resources than those anticipated to occur within the HGLA. Binary process geothermal facilities were eliminated from consideration within the RFD, however, the eventual footprint such a facility might have is not expected to greatly differ from a dual-flash design facility on an acre of disturbance per MW basis.

2.4.3.2 Dry Steam Plant

Dry steam power plants are relatively simple and require only steam and condensate injection piping and minimal steam cleaning devices. They utilize steam produced directly from geothermal reservoirs to run the turbines that power the generator. No separation is necessary because wells only produce steam. Dry steam reservoirs, however, are rare and are not anticipated to exist within the HGLA.

2.4.3.3 Dry Cooling System

The HGLA is located in an area of scarce water resources. As an alternative to the proposed use of wet cooling towers, the BLM considered air-cooled or dry cooling towers for steam condensation. The efficiency of power generation for air cooled systems is affected by the difference between the temperature of the fluid exiting the turbine and the temperature of the cooling medium. The HGLA is located in the high desert and, during the summer months, energy demands increase due to higher ambient air temperatures and extensive use of air conditioners by businesses. The high temperatures would pose a problem with cooling the power plant, and overall efficiency would decrease during times of greatest need, therefore, air cooling was eliminated from further analysis because it is not feasible given the anticipated high temperatures expected in the HGLA.

2.4.4 Alternative Sites

Alternative sites were not considered since alternative sites would not meet the purpose of and need for this action which is to evaluate the HGLA for the potential to lease the area for geothermal exploration and development. This alternative has been eliminated from further consideration.

2.5 ALTERNATIVES COMPARISON

The table below is a side by side comparison of the proposed alternatives for the HGLA.

Table 2-3 HGLA Alternatives Comparison

	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E
The CDCA Plan would be amended: BLM administered lands within the HGLA are identified as open for geothermal leasing (up to 22,460 acres).	X		X	X	
The CDCA Plan would be amended: Specific acreages within the HGLA would be identified as open for geothermal leasing, but subject to restrictions on use such as CSU or NSO stipulations.			X	X	
The CDCA Plan would be amended: Specific acreages within the HGLA will be identified as closed for geothermal leasing, with other acreage identified as open.				X	
The CDCA Plan would be amended: All BLM administered lands within the HGLA would be closed for geothermal leasing.		X			
The CDCA Plan would not be amended: The CDCA Plan identifies the area as unclassified for geothermal leasing.					X
Groundwater extraction for consumptive use prohibited or restricted by stipulation.	X		X	X	
Pending geothermal applications would be denied.		X			X
Pending geothermal applications would be authorized.	X		X	X	

2.6 LEASE STIPULATIONS, MITIGATION MEASURES, BEST MANAGEMENT PRACTICES, AND PROCEDURES

2.6.1 Lease Stipulations

Lease stipulations are enforceable requirements or constraints that would be applied, as appropriate within the HGLA, to any geothermal lease that may be authorized under the action alternatives that would authorized geothermal exploration and development

(Alternatives A, C, and D). A lease stipulation is a condition of lease issuance that identifies processes or requirements that the lessee shall follow during all phases of the lease. These stipulations may be designed to provide protection for the federal government, provide clear steps to follow when certain conditions may occur, or provide protection to resource values or land uses. Standard stipulations from the Final Programmatic Environmental Impact Statement for Geothermal Leasing in the Western United States (PEIS), October 2008, along with Standard Stipulations on Form 3200-24a, are hereby adopted for this EIS and proposed plan amendment. Lease stipulations and procedures for the HGLA will be applied as outlined in the PEIS.

Any changes to these stipulations will be made in accordance with the land use plan and/or the regulatory provisions for such changes. (For guidance on the application and use of these stipulations, see BLM Manual 1624 and 3101, or FS Manual 1950 and 2820.)

To ensure leasing decisions remain appropriate in light of continually changing circumstances and new information, the BLM develops and applies lease stipulation exception, waiver, and modification criteria. An exception, waiver, or modification may not be approved unless, (1) the authorized officer determines that the factors leading to the stipulation's inclusion in the lease have changed sufficiently to make the protection provided by the stipulation no longer justified; or (2) the proposed operations would not cause unacceptable impacts. (43 CFR 3101.1-4)

- An **exception** is a one-time exemption for a particular site within the leasehold; exceptions are determined on a case-by-case basis; the stipulation continues to apply to all other sites within the leasehold. An exception is a limited type of waiver.

- A **waiver** is a permanent exemption from a lease stipulation. The stipulation no longer applies anywhere within the leasehold.

- A **modification** is a change to the provisions of a lease stipulation, either temporarily or for the term of the lease. Depending on the specific modification, the stipulation may or may not apply to all sites within the leasehold to which the restrictive criteria are applied.

An exception, waiver, or modification may be approved if the record shows that circumstances or relative resource values have changed or that the lessee can demonstrate that operations can be conducted without causing unacceptable impacts and that less restrictive requirements would meet resource management objectives. This process is more fully explained in the PEIS, Chapter 2.2.2 and is incorporated in this document by reference.

STANDARD STIPULATIONS

In direct response to public comment, consultation, and staff recommendation, the following standard lease stipulations were developed for the HGLA. These stipulations will be required, and applied to each of the action alternatives that authorize geothermal leasing, Alternatives A, C, and D, with the two following exceptions: NSO-HGLA-1 shall only apply to Alternative C, and the application of SA-HGLA-10 to Alternative A is restricted as described in Section 2.3.1.

NO SURFACE OCCUPANCY (NSO) STIPULATIONS

NSO-HGLA-1: No surface occupancy or use is allowed on the lands within the identified sensitive resources area within the HGLA.

The sensitive resources area is defined by the geospatial data file pictured in the HGLA Final EIS, Figure 2.3.3-1. This area is nominally, but not exclusively identified by a specific set of plants, animals, and soils found within the HGLA. The data file provides latitude and longitude for each point along the NSO boundary between the Open areas and the NSO areas within the HGLA. All points along the NSO boundary shall be considered to be within the NSO area.

Should any question arise as to the absolute location of the NSO, the lessee shall be responsible for a professional survey that shall mark the NSO boundary with markers at periodic intervals that are acceptable to the authorized officer.

Purpose: This stipulation is for the protection of sensitive resources that include, but are not limited to, the Mojave Ground Squirrel, the Desert Tortoise, cultural resources, historical resources, and groundwater.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan that demonstrates that impacts from the proposed action are minimal or can be adequately mitigated.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting the sensitive resources.

Waiver: This stipulation may be waived if the authorized officer determines that the entire leasehold can be occupied without adversely affecting the sensitive resources.

NSO-HGLA-2: No surface occupancy or surface use is allowed within the Rose Springs Area of Critical Environmental Concern (ACEC).

The Rose Springs ACEC can be found within the Mount Diablo Meridian and is defined as:

Township 21 South, Range 37 East,
Section 11, lot 1, 2, 9 to 11, inclusive, 14, W1/2NW1/4NW1/4NE1/4, NW1/4SW1/4NW1/4NE1/4, NE1/4NW1/4, W1/2SE1/4SW1/4;

Section 14, lots 2, 3, lot 11, W1/2NE1/4NW1/4, NW1/4SW1/4, W1/2SW1/4SW1/4, NE1/4SW1/4SW1/4, and NW1/4SE1/4SW1/4SW1/4;
Inyo County, California

Purpose: This stipulation is for the protection of cultural and historical resources found within the Rose Springs ACEC.

Exception: No exceptions will be granted.

Modification: No modifications will be granted.

Waiver: No waivers will be granted.

CONTROLED SURFACE USE (CSU) STIPULATIONS

CSU-HGLA-1: The use of all lands within the HGLA shall be controlled with regard to the following set of stipulations. The HGLA is within the Mount Diablo Meridian and is generally defined as lands within the following sections:

Township 21 South, Range 37 East, Sections 11-14, 23-26, 35-36
Township 21 South, Range 38 East, Sections 7-10, 15, 17-22, 27-34
Township 22 South, Range 37 East, Sections 1-2, 11-12
Township 22 South, Range 38 East, Sections 5-8

Purpose: To conserve the Mojave Ground Squirrel (XerospermophilusMojavensis) (MGS) and its habitat. Potential MGS habitat is defined as any area where MGS is likely to occur based on compatible vegetation, soil, elevation, climate, and region.

Known MGS habitat is defined as those areas where MGS have been observed. The HGLA site contains potential and known habitat for the MGS. This habitat is identified by creosote bush scrub with a diverse mix of sub-shrubs and herbaceous plants, with shrubs in the Chenopodiaceae (spiny hopsage, winterfat, Atriplex species) being favored. Areas of potential MGS habitat within the HGLA have been identified using the criteria noted above. These areas are shown on Figure 2.3.3-1 and Figure 2.3.4-1.

a) In areas where potential habitat for the MGS exists, presence shall be assumed and spring trapping surveys are to be conducted prior to any ground disturbing activity on undisturbed ground. Such surveys shall be conducted according to the California Department of Fish and Game (CDFG) protocol i.e. the trapping methodologies out-lined in the *California Department of Fish and Game Mojave Ground Squirrel Survey Guidelines*.

b) If MGS are detected using trapping surveys or if known habitat is present and trapping is not conducted, the proponent must obtain a 2081 Incidental Take Permit from CDFG prior to proceeding with any ground disturbing activity.

c) If trapping that follows CDFG protocol does not detect MGS, or if identified MGS habitat does not exist within the area of proposed disturbance, mitigation and a permit are not necessary for the year in which the ground disturbing activity will occur.

d) If ground-disturbing activities do not begin within the year that trapping was conducted, presence of the species shall be assumed, and the procedure identified in a), above, shall be followed.

<u>Exception</u>: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan that demonstrates that impacts from the proposed action are minimal or can be adequately mitigated.

<u>Modification</u>: No modifications will be granted.

<u>Waiver</u>: No waivers will be granted.

<u>CSU-HGLA-2</u>: The use of all lands within the HGLA shall be controlled with regard to the following set of stipulations. The HGLA is within the Mount Diablo Meridian and is defined as lands within the following sections:

Township 21 South, Range 37 East, Sections 11-14, 23-26, 35-36
Township 21 South, Range 38 East, Sections 7-10, 15, 17-22, 27-34
Township 22 South, Range 37 East, Sections 1-2, 11-12
Township 22 South, Range 38 East, Sections 5-8

Purpose: to protect threatened, endangered, or other special status species, since the lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or other special status species.

a) BLM may require modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activity that will contribute to a need to list such a species or their habitat.

b) BLM may require modifications to or disapprove proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat.

c) BLM will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 USC 1531 et seq., including completion of any required procedure for conference or consultation.

d) The holder shall comply with the Biological Opinion for listed and proposed species associated with this project signed by the US Fish and Wildlife Service. Failure to comply with the requirements of the Biological Opinion shall be cause for lease suspension or termination as provided in 43 CFR 3213.17 and 43 CFR 3200.4

e) Unless otherwise agreed to in writing by the Authorized Officer, power lines shall be constructed in accordance with standards outlined in "Suggested Practices for Raptor Protection on Power lines", Raptor Research Foundation, Inc., 1996. The holder shall assume the burden and expense of proving that pole designs not shown in the above publication are "eagle safe." Such proof shall be provided by a raptor expert approved by the Authorized Officer. The BLM reserves the right to require modifications or additions to all power line structures placed on this right-of-way, should they be necessary to ensure the safety of large perching birds. Such modifications and/or additions shall be made by the holder without liability or expense to the United States.

f) Bald and/or golden eagles may now or hereafter be found to utilize the project area. The BLM will not issue a notice to proceed for any project that is likely to result in take of bald eagles and/or golden eagles until the applicant completes its obligation under applicable requirements of the Eagle Act, including completion of any required coordination with the FWS or permit. The BLM hereby notifies the applicant that compliance with the Eagle Act is a dynamic and adaptable process which may require the applicant to conduct further analysis and mitigation following assessment of operational impacts. Any additional analysis or mitigation required to comply with the Eagle Act will be developed with the FWS and coordinated with the BLM.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan that demonstrates that impacts from the proposed action are minimal or can be adequately mitigated.

Modification: No modifications will be granted.

Waiver: No waivers will be granted.

CSU-HGLA-3: The use of all lands within the HGLA shall be controlled with regard to the following set of stipulations. The HGLA is within the Mount Diablo Meridian and is defined as lands within the following sections:

Township 21 South, Range 37 East, Sections 11-14, 23-26, 35-36
Township 21 South, Range 38 East, Sections 7-10, 15, 17-22, 27-34
Township 22 South, Range 37 East, Sections 1-2, 11-12
Township 22 South, Range 38 East, Sections 5-8

Purpose: to protect historic properties and/or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, E.O. 13007, or other statutes and executive orders.

a) The BLM will not approve any ground disturbing activities that may affect any such properties or resources until it completes its obligations under applicable requirements of the NHPA and other authorities.

b) The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated.

c) Any cultural and/or paleontological resource (historic or prehistoric site or object) discovered by the holder, or any person working on its behalf, on public or Federal land shall be immediately reported to the Authorized Officer. The holder shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the Authorized Officer. An evaluation of the discovery will be made by the Authorized Officer to determine appropriate actions to prevent the loss of significant cultural or scientific values. The holder will be responsible for the cost of evaluation and any decision as to proper mitigation measures will be made by the Authorized Officer after consulting with the holder.

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

e) All field work will be performed under a Cultural Resource Use Permit issued by the BLM.

f) A pedestrian inventory will be undertaken for 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 (NRHP). Those sites not already evaluated for NRHP eligibility will be evaluated based on surface remains, subsurface testing, archival data, and/or ethnographic sources. Archaeological survey and subsurface investigation will be monitored by tribal representatives, if requested. Subsurface testing will 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 will be submitted to the BLM. The BLM will make determinations of eligibility and effect and consult with the State Historic Preservation Offices (SHPO) as necessary based on each proposed lease application and project plans. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated. Avoidance of impacts through project design will be given priority over data recover 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. Any data recovery will be preceded by approval of a detailed research design, tribal consultation, and other requirements for BLM issuance of a cultural resource use permit under Federal Land Policy and Management Act (FLPMA).

g) If an area exhibits a high potential for containing cultural resources, but no artifacts were observed during an archaeological survey, monitoring by a qualified archaeologist could be required during all excavation and earthmoving in the high-potential area.

h) Based on the results of survey and other investigations, the BLM may require a Cultural Resource Management Plan (CRMP) that details site-specific mitigation activities. The CRMP also will: 1) establish a monitoring program; 2) identify measures to prevent potential looting/vandalism or erosion impacts; and 3) address the education of workers and the public to make them aware of the consequences of unauthorized collection of artifacts and destruction of property on public land.

i) Unexpected discovery of cultural or paleontological resources during construction will be brought to the attention of responsible BLM authorized officer immediately. Work will be halted in the vicinity of the find to avoid further disturbance to the resources while they are being evaluated and appropriate mitigation measures are being developed.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan that demonstrates that impacts from the proposed action are minimal or can be adequately mitigated.

Modification: No modifications will be granted.

Waiver: No waivers will be granted.

TIMING LIMITATION (TL) STIPULATIONS

TL-HGLA-1: The use of all lands within the HGLA shall be controlled with regard to the following set of stipulations. The HGLA is within the Mount Diablo Meridian and is defined as lands within the following sections:

Township 21 South, Range 37 East, Sections 11-14, 23-26, 35-36
Township 21 South, Range 38 East, Sections 7-10, 15, 17-22, 27-34
Township 22 South, Range 37 East, Sections 1-2, 11-12
Township 22 South, Range 38 East, Sections 5-8

Purpose: To conserve the Desert Tortoise (Gopherusagassizii) and its habitat, the following stipulations apply.

a) The HGLA is near the northern extent of the desert tortoise range. Prior to ground disturbance, desert tortoise protocol surveys shall be conducted according to guidelines set forth by the Ventura Office of the U.S. Fish and Wildlife Service (USFWS) (http://www.fws.gov/ventura/speciesinfo/protocols_guidelines/).

b) The lease holder shall conduct project exploration, development, and construction activities when desert tortoises are inactive (typically November 1 to March 14), to minimize impacts to roaming individuals.

c) The lease holder shall retain a desert tortoise Authorized Biologist approved by CDFG and USFWS who would be responsible for ensuring compliance with desert tortoise stipulations prior to the initiation of and during ground-disturbing activities. The Authorized Biologist shall conduct clearance surveys, tortoise handling, artificial burrow construction, egg handling and other procedures in accordance with the *Guidelines for Handling Desert Tortoise during Construction Projects* (Desert Tortoise Council 1994) or the most current guidance provided by USFWS.

d) The Authorized Biologist shall be present on-site from March 15 through October 31 (active season) during ground-disturbing activities in areas that have not been enclosed with tortoise exclusion fencing. The Authorized Biologist should be on-call from November 1 to March 14 (inactive season) and shall check construction areas that have not been enclosed with tortoise exclusion fencing immediately before construction activities begin at all times.

e) The lease holder shall incorporate desert tortoise exclusion fencing, approved by USFWS and CDFG, into any permanent fencing surrounding the proposed facility prior to the initiation of ground disturbing activities to avoid potential harm to desert tortoise in the project area. Tortoise exclusion fencing should be constructed in accordance with the *Desert Tortoise Exclusion Fence Specifications* (USFWS 2005) or the most current guidance provided by USFWS and CDFG.

f) The lease holder shall install desert tortoise exclusion fencing around temporary project areas such as staging areas, storage yards, excavations, and linear facilities during construction. Construct fences in late winter or early spring to minimize impacts to tortoises and accommodate subsequent tortoise surveys.

g) Within 24 hours prior to the initiation of construction of tortoise exclusion fence, the Authorized Biologist shall survey the fence alignment to ensure it is cleared of desert tortoises. Following construction of the tortoise-exclusion fence, the Authorized Biologist shall conduct clearance surveys within the fenced area to ensure as many desert tortoises as possible have been removed from the site.

h) The lease holder shall install and regularly maintain gates that remain closed, except for the immediate passage of vehicles, to prevent desert tortoise passage into the project area.

i) Heavy equipment shall only be allowed to enter the project site following the completion of desert tortoise clearance surveys of the project area by the Authorized Biologist. The Authorized Biologist shall monitor initial clearing and grading activities to ensure any tortoises missed during the initial clearance survey are moved from harm's way.

j) The lease holder shall ensure that any damage to the permanent or temporary fencing is immediately blocked to prevent tortoise access and permanently repaired within 72 hours between March 15 and October 31, and within 7 days between November 1 and March 14. Following installation, the permanent fencing should be inspected quarterly and after major rainfall events to ensure fences are intact and there is no ground clearance under the fence that would allow tortoise to pass.

k) The Authorized Biologist shall inspect any construction pipe, culvert, or similar structure with a diameter greater than 3 inches, stored less than 8 inches aboveground and within desert tortoise habitat (i.e., outside the permanently fenced area) for one or more nights, before the material is moved, buried or capped. As an alternative, all such structures may be capped before being stored outside the fenced area, or placed on pipe racks. These materials would not need to be inspected or capped if they are stored within the permanently fenced area after desert tortoise clearance surveys have been completed.

l) The lease holder shall ensure vehicular traffic does not exceed 25 miles per hour within the delineated project areas or on access roads in desert tortoise habitat.

On unpaved roads the speed limit should be 10 miles per hour to suppress dust and protect air quality.

m) Any time a vehicle or construction equipment is parked in desert tortoise habitat outside the permanently fenced area, the Authorized Biologist or drivers of the vehicle shall inspect the ground under the vehicle for the presence of desert tortoise before it is moved. If a desert tortoise is observed, it should be left to move on its own. If it does not move within 15 minutes, the Authorized Biologist may remove and relocate the animal to a safe location.

n) The lease holder shall design culverts to allow safe passage of tortoises.

o) If desert tortoise relocation is determined to be an appropriate conservation measure, the lease holder shall develop and implement a Desert Tortoise Translocation Plan for approval by CDFG, USFWS, BLM and other permitting agencies. The Plan shall designate a relocation site as close as possible to the disturbance site that provides suitable conditions for long term survival of the relocated desert tortoise and outline a method for monitoring the relocated tortoise.

p) If desert tortoises are observed within the HGLA, consult with CDFG and USFWS to determine the need for and/or feasibility of conducting relocation or translocation as minimization or mitigation for project impacts. Development and implementation of a translocation plan may require, but not be limited to, additional surveys of potential recipient sites; disease testing and health assessments of translocated and resident tortoises; and consideration of climatic conditions at the time of translocation. Because of the potential magnitude of the impacts to desert tortoise from proposed renewable energy projects, CDFG and USFWS must evaluate translocation efforts on a project by project basis in the context of cumulative effects.

q) If the desert tortoise protocol surveys indicate that there are no desert tortoises, and/or desert tortoise habitat, within the project area, the lease holder may apply for a waiver to one or more of the above stipulations.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan that demonstrates that impacts from the proposed action are minimal or can be adequately mitigated.

Modification: No modifications will be granted.

Waiver: No waivers will be granted.

SPECIAL ADMINISTRATION (SA) STIPULATIONS

SA-HGLA-1: The BLM Authorized Officer for the administration of this lease is the Field Manager, Ridgecrest Field Office, Ridgecrest, CA; Phone 760-384-5400.

Exception: No exceptions will be granted.

Modification: No modifications will be granted.

Waiver: No waivers will be granted.

SA-HGLA-2: Unitization Stipulation – The lessee shall fully commit the lease to a geothermal unit acceptable to the Bureau of Land Management within 6 months of the effective date of the lease. Failure to commit the lease to a geothermal unit acceptable to the Bureau of Land Management shall subject the lease to cancellation.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan that demonstrates that impacts from the proposed action are minimal or can be adequately mitigated.

Modification: No modifications will be granted.

Waiver: No waivers will be granted.

SA-HGLA-3: The lease holder shall construct, operate, and maintain the facilities, improvements, and structures within this geothermal lease area in strict conformity with the approved Plan of Development (POD), as amended or supplemented by approval of the Authorized Officer. All exploration, development, construction, and reclamation activities shall conform as nearly as possible to the latest edition of the BLM / U.S. Forest Service publication: The Gold Book – *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development*. Any surface disturbing activity, additional construction, or use that is not in accord with the approved Plan of Development shall not be initiated without the prior written approval of the Authorized Officer. A copy of the lease, including all stipulations and approved Plan of Development, shall be available at all times onsite during construction, operation, and decommissioning. Noncompliance with the above will be grounds for immediate temporary suspension of activities if it constitutes a threat to public health or safety or the environment.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan that demonstrates that impacts from the proposed action are minimal or can be adequately mitigated.

Modification: No modifications will be granted.

Waiver: No waivers will be granted.

SA-HGLA-4: Actions and activities of the lease holder within the HGLA will be governed by all mitigation measures and best management practices detailed in the *Best Management Practices and Guidance Manual: Desert Renewable Energy Projects*, September 2010, as directed by the Authorized Officer.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan that demonstrates that impacts from the proposed action are minimal or can be adequately mitigated.

Modification: A modification to this stipulation may be granted by the authorized officer if the operator submits a plan that demonstrates that impacts from the proposed action are minimal or can be adequately mitigated.

Waiver: No waivers will be granted.

SA-HGLA-5: Actions and activities of the lease holder within the HGLA will be governed by all mitigation measures and best management practices as detailed in the *Geothermal Resources Leasing Programmatic EIS,* October 2008, as directed by the Authorized Officer.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan that demonstrates that impacts from the proposed action are minimal or can be adequately mitigated.

Modification: A modification to this stipulation may be granted by the authorized officer if the operator submits a plan that demonstrates that impacts from the proposed action are minimal or can be adequately mitigated.

Waiver: No waivers will be granted.

SA-HGLA-6: The lease holder will be liable for all fire suppression costs resulting from fires caused during construction or operations. The holder shall comply with all guidelines and restrictions imposed by agency fire control officials.

Exception: No exceptions will be granted.

Modification: No modifications will be granted.

Waiver: No waivers will be granted.

SA-HGLA-7: The three non-competitive lease applications (CACA 043998, CACA 044082, CACA 043993) within the HGLA were pending on August 8, 2005. Therefore, all geothermal leases will be issued subject to the revised regulations at *43 CFR 3200.8 (b)(1)* and *(b)(3)*. The lease applicant must make its election, and provide written notice to the BLM of their preference for payment of royalties on production, before the lease may be issued.

Exception: No exceptions will be granted.

Modification: No modifications will be granted.

Waiver: No waivers will be granted.

SA-HGLA-8: Potential geothermal lessees should be aware of the revised due diligence requirements contained in the federal regulations at *43 CFR § 3207*. Leases are typically issued for an initial term of 10 years, and may be extended if diligent work requirements have been satisfied, and the BLM believes that the lessee has made satisfactory progress in complying with the lease terms and stipulations.

Exception: No exceptions will be granted.

Modification: No modifications will be granted.

Waiver: No waivers will be granted.

SA-HGLA-9: The BLM may, after giving you 30 days written notice, terminate your lease if we determine that you have violated any of the requirements of *43 CFR § 3200.4*, including, but not limited to compliance with the terms and conditions of the lease, including any and all lease stipulations, the nonpayment of required annual rentals or royalties and fees (*43 CFR § 3213.17*.)

Exception: No exceptions will be granted.

Modification: No modifications will be granted.

Waiver: No waivers will be granted.

SA-HGLA-10: The consumptive use of water within the HGLA shall be controlled with regard to the following set of stipulations. The HGLA is within the Mount Diablo Meridian and is defined as lands within the following sections:

Township 21 South, Range 37 East, Sections 11-14, 23-26, 35-36
Township 21 South, Range 38 East, Sections 7-10, 15, 17-22, 27-34
Township 22 South, Range 37 East, Sections 1-2, 11-12
Township 22 South, Range 38 East, Sections 5-8

Purpose: to protect and conserve the water resources that may be present within the HGLA and the Rose Valley Basin.

a) Groundwater extraction for consumptive use during geothermal project operations will be prohibited throughout the entire HGLA, except as allowed under item (c) below.

b) Groundwater extraction for consumptive use during geothermal exploration and development activities may be allowed, with the expressed approval of the Authorized Officer, for some leasing applications to the extent that groundwater extraction and water loss to the aquifer, in combination with all other authorized groundwater uses, does not exceed the safe yield (defined in item g) below) in the Rose Valley Aquifer, and does not cause a decline of 10% or more to the average annual fluctuation of water flowing into the surface features at Little Lake, when combined with all other approved uses.

c) Groundwater extraction for consumptive use during geothermal project operations may only be allowed by approved exception, provided the proposed extraction and loss to the aquifer, meets the requirements for exploration and development activities for consumption: this use must not exceed the safe yield (defined in item g) below) in the Rose Valley Aquifer, and not cause a decline of 10% or more to the average annual fluctuation of water flowing into the surface features at Little Lake, when combined with all other approved uses. To obtain an exception, a plan of operations must be submitted along with mitigation and remediation plans that specifically address groundwater extraction for consumptive use. An approved exception will consist of a declaration of exception, signed by the Authorized Officer, that will include other exception requirements to be determined on a per project, or per activity basis.

d) Groundwater extraction for consumptive use during geothermal exploration, development, and project operations activities may be allowed, with the expressed approval of the Authorized Officer, for some leasing applications to the extent that groundwater extraction and water loss to the aquifer, in combination with all other authorized groundwater uses, does not exceed the safe yield (defined in item g) below) in the Rose Valley Aquifer, and does not cause a decline of 10% or more to the average annual fluctuation of water flowing into the surface features at Little Lake, when combined with all other approved uses.

e) Water produced or used for the construction, operation, maintenance, or remediation of the project shall be solely for the beneficial use of the renewable energy project or its associated mitigation and remediation measures, as specified in approved plans and permits.

f) The siting, construction, operation, maintenance, and remediation of all wells shall conform to specifications contained in the California Department of Water Resources Bulletins #74-81 and #74-90.

g) A water supply assessment shall be prepared and must be approved by the Authorized Officer prior to the development or use of any water resources. This assessment shall identify the groundwater basin(s) and the surface water basin(s) related to water delivery and supply, as well as the aquifer(s) contained within them. A water budget shall be established based on the best available data and practices for the identified basin(s). This water budget shall classify and describe all water inflow and outflow to the identified basin(s) or system using the following basic hydrologic formula or a derivation: $P - R - E - T - G = \Delta S$, where P is precipitation and groundwater inflow, R is surface runoff or outflow, E is evaporation, T is transpiration, G is groundwater outflow, and ΔS is the change in storage. The volumes involved in this calculation shall be in units of acre-feet per year. Safe Yield is defined as that amount, such that $P - R - E - T - G$ is greater than or equal to zero.

h) A Water Monitoring, Management, and Mitigation Plan shall be prepared and must be approved by the Authorizing Officer prior to the development or use of any water resources. The quality and quantity of all surface water and groundwater used for the project shall be monitored using this plan. The plan shall detail the management and use of all project-related water resources. The plan shall also detail any mitigation measures that may be required as a result of the project.

i) Ensure that any wastewater generated in association with temporary, portable sanitary facilities is periodically removed by a licensed hauler and disposed into an existing municipal sewage treatment facility.

j) Temporary, portable sanitary facilities provided for construction crews should be adequate to support expected on-site personnel and should be removed at completion of construction activities.

k) Comply with local requirements for permanent, domestic water use and wastewater treatment.

l) Lease holder shall identify the source(s) of project water, and provide analysis proving that adequate quantity and quality of water are available from identified source(s) for the life of the geothermal project.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan that demonstrates that impacts from the proposed action are minimal or can be adequately mitigated.

Modification: No modifications will be granted.

Waiver: No waivers will be granted.

2.6.2 Mitigation Measures and Best Management Practices (BMP)

In addition to the various lease stipulations, the BLM may also require a number of BMPs as conditions of any lease under the action alternatives. The Renewable Energy Action Team (REAT) agencies (California Energy Commission [CEC], California Department of Fish and Game [CDFG], BLM, and U.S. Fish and Wildlife Service (USFWS) jointly prepared the *Best Management Practices and Guidance Manual: Desert Renewable Energy Projects*, September 2010. The manual fulfills agency commitments in the State of California's Executive Order (EO) S-14-08, Secretary of the Interior Secretarial Order (S.O.) No. 3285, and related memoranda between California and the U.S. Department of Interior (DOI), and between the REAT agencies (signed in 2008 and 2009). The mitigation measures and BMPs proposed in the manual have been adopted for this EIS. Best Management Standards and Reclamation Performance Standards that are relevant to the HGLA, and may apply to all action alternatives that authorize geothermal leasing, are listed in Appendix A.

2.6.2.1 Mitigation Measures and Best Management Practices Specific to Geothermal

Agency Decisions and Permitting Guides

The BLM has published environmental BMPs on its website and in *The Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development* (BLM 2007) (commonly referred to as the Gold Book). Although these references were published as guidance and standards for the oil and gas industry, the mitigation measures for roads, transmission lines, pipelines, buildings, and screening are applicable guidance for developing and implementing BMPs for geothermal resource power plants. This document has been adopted for this EIS and will be applied to geothermal exploration and development within the HGLA.

The CEC approved the Salton Sea Unit #6 Power Project (CEC Publication No. 800-03-021, 2003) with conditions of certification and published a geothermal resources permitting guide (Blaydes & Associates 2007). Both documents provide examples of and explain in detail the requirements for developing geothermal wells and power plants in California. This document has been adopted for this EIS.

BMP's for geothermal energy are incorporated into this EIS by reference, from the Final Programmatic Environmental Impact Statement for Geothermal Leasing in the Western United States (PEIS). The Record of Decision for the Geothermal PEIS was signed on December 17, 2008.

Best Management Practices

Best Management Practices (BMP) are state-of-the-art mitigation measures applied on a site-specific basis to avoid, minimize, reduce, rectify, or compensate for adverse environmental or social impacts. They are applied to management actions to aid in achieving desired outcomes for safe, environmentally responsible resource development, by preventing, minimizing, or mitigating adverse impacts and reducing conflicts.

The BLM will incorporate appropriate environmental BMPs into proposed use authorizations after appropriate environmental review. Environmental BMPs to be considered in nearly all circumstances include the following:

- Interim reclamation of well locations and access roads soon after the well is put into production;
- Painting of all new facilities a color that best allows the facility to blend with the background, typically a vegetated background;

- Design and construction of all new roads to a safe and appropriate standard, "no higher than necessary" to accommodate their intended use; and
- Final reclamation of all disturbed areas, including access roads, to the original contour or a contour that blends with the surrounding topography.

Other environmental BMPs are more suitable for consideration by an administrative unit on a case-by-case basis, (1) depending on their effectiveness, (2) the balancing of increased operating costs vs. the benefit to the public and resource values, (3) the availability of less restrictive mitigation alternatives that accomplish the same objective, and (4) other site specific factors.

Guidelines for applying and selecting project-specific requirements include determining whether the measure would (1) ensure compliance with relevant statutory or administrative requirements, (2) minimize local impacts associated with siting and design decisions, (3) promote post construction stabilization of impacts, (4) maximize restoration of previous habitat conditions, (5) minimize cumulative impacts, or (6) promote economically feasible development of geothermal energy on BLM-administered lands.

Where the BMPs identified in the PEIS are inconsistent or incompatible with those developed under the HGLA EIS, the staff will determine the appropriate practices during the site-specific environmental review. Only those individual mitigation measures reasonably necessary to ensure environmentally responsible geothermal development should be selected. BMPs and mitigation measures should be dependent on factors such as the project size, location, site specific characteristics, and potential resource impacts. Prior to inclusion into a permit, the measures may be further modified to meet site-specific situations and agency requirements. Typical BMPs can also be found on the BLM Washington Office Fluid Minerals web site at: www.blm.gov/bmp and in Appendix A.

Geothermal project developers are advised to incorporate the general BMPs applicable to their project and project site. The following BMPs are specific to geothermal projects and are recommended for consideration by project developers. The BMPs below build on decisions and guides mentioned above in the Geothermal Energy Power Plants section of this section in addition to Environmental, Health and Safety Guidelines for Geothermal Power Development (International Finance Corporation 2007), recommended controls on hydrogen sulfide gas (H2S) emissions (Nagl, n.d.), examples of waste discharge requirements (State of California Regional Water Quality Control Board [RWQCB], Colorado River Basin Region 2007), and injection well guidance (EPA 1999).

Air Quality

The following air quality BMPs include recommendations to reduce emissions of criteria or hazardous air pollutants and H2S. The EPA does not classify H2S as either a criteria air pollutant or a hazardous air pollutant. The State of California, however, adopted an Ambient Air Quality Standard for H2S to protect public health and decrease odor annoyance. Air pollution control/management districts may have short-term, maximum (for example, hourly) and annual average standards for stationary sources of H2S, including geothermal power plants. For example, the Imperial County Air Pollution Control District requires Best Available Control Technology be applied to geothermal power plants with the potential to emit more than 55 pounds per day of H2S (County of Imperial 1999).

Develop an emissions inventory, a list of both long-term (annual) and short-term (generally hourly) emission rates for each relevant pollutant from each emission point source (such as well venting, drill rig diesel engines, fugitive dust, plant silencers, sulfur plant exhaust, cooling towers). Organize emissions inventory by project phase: well-field development (estimate number of wells to be drilled, vented each year); plant operations (estimate number of replacement wells to be drilled each year, and forced and planned outage rates). Quantify the pollutants contained in the geothermal fluids and steam by testing well venting. Collect fluid and gas samples for every well using independent laboratory and air quality specialist for at least one round of sample collection and chemical analysis.

a) Own both the geothermal production and injection wells as well as the geothermal power plant, so that responsibility for H2S emission control is not lost between the steam producer and electricity generator.

b) As an integral part of an odor control program, implement an ambient monitoring program for H2S and meteorology. Continue to operate the meteorological station used to collect baseline data. Use an EPA reference sulfur dioxide monitor with an in-line sulfur dioxide (SO_2) scrubber and H2S to SO_2 oxidizer for real-time collection of less than 1 part per billion H2S. Store hourly H2S and wind data for use whenever odor issues arise.

c) Remove H2S from condensate by directing the condensate to the cooling tower to which chelated iron and sodium sulfite has been added to the cooling-tower water. These chemicals will react with the H2S to form a water soluble chemical, which can be injected into the geothermal formation.

d) Remove H2S from both the condensate and non-condensable gas (NCG) stream by processing the NCG in a thermal oxidizer.

e) When present in small volumes in the NCG stream, remove H2S with liquid scavengers, rather than solid-based scavengers, so that the spent material can be injected into the geothermal formation for disposal rather than discarded in a landfill.

f) When present in large volumes in the NCG stream, remove H2S with a liquid redox system.

g) Inject hydrogen peroxide and sodium hydroxide into a well's test line to abate H2S emissions.

Hazards, Pesticides, Waste Management

a) Increase the pH of spent geothermal brine to keep silica in solution prior to reinjection.

b) Return spent geothermal brines, steam condensate, and cooling system blow-down to the geothermal resource via reinjection wells.

c) Assure that hazardous substances and wastes removed from surface impoundments are not leaked, spilled, or otherwise improperly released outside the surface impoundments and into the environment.

d) Remediate any contamination near and around surface impoundments, including the tops of berms and areas downwind from the impoundments, filter cake bay storage areas, hydroblast pads and adjacent areas, pipes containing hazardous waste scale and areas adjacent, and other areas where hazardous waste releases or disposals have occurred.

e) Minimize releases of filter cake into the environment by enclosing filter cake bays with doors or replace filter cake bays with containers or trailers capable of holding the waste material.

f) Prevent filter cake from being released or disposed of into the environment during the transfer to, from, or while stored at the filter cake bays or in end-dump trailers.

g) Ensure that all employees and contractors staff operating at any facility receive appropriate hazardous waste management and high pressure high temperature (HPHT) training prior to conducting any work involving hazardous waste.

including hazardous waste treatment, storage, and disposal at the facility, or HPHT environments, including well site, pipeline, and power plant operations.

h) Conduct annual environmental audits to identify all hazardous waste streams and determine compliance with all applicable statutory and regulatory provisions of California's Hazardous Waste Control Law and the Unified Hazardous Waste and Hazardous Materials Management Regulatory Program.

i) Maintain a minimum freeboard of two feet at all times within the geothermal brine surface impoundment. Ensure the fluids and brine precipitates discharged to and contained in the surface impoundment never overflow.

j) Install a leak detection system beneath the membrane liner of the geothermal brine surface impoundment. Inspect the system quarterly to ensure brine is not collecting due a membrane-liner breach.

k) Monitor groundwater wells to determine whether the geothermal brine surface impoundment is releasing hazardous waste into groundwater.

l) Clean conveyance systems regularly to prevent buildup of silica scale and the potential for release of solid materials from conveyance systems.

m) Perform pipe maintenance and de-scaling only in areas designated for these activities.

n) Construct hydro blasting areas so that the base is impermeable base and no wastewater can spray or run onto adjacent soil. For example, the hydro blasting area should have 12-foot-high walls on three sides. Convey wastewater from the hydro blasting process to the brine surface impoundment for reinjection to the geothermal resource.

o) Containerize drilling mud and cuttings, when possible. Placing muds and cuttings in containers, such as Baker tanks, may not always be practical, but is a practice that avoids discharging such wastes to land.

Noise

BLM regulations seek to "minimize noise," but set no measurable standard. BLM relies on noise criteria published in 1975 by the USGS in "Geothermal Resources Operational Order No. 4." The order is applicable to people occupying nearby homes, hospitals, schools, and libraries and wildlife, according to the 2008 PEIS and states that federal land lessees may:

> *"not exceed a noise level of 65 dB(A) for all geothermal-related activity including but not limited to, exploration, development, or production operations as measured at the lease boundary line or 0.8 km (one-half mile) from the source, whichever is greater, using the A-weighted network of a standard Sound Level Meter. However, the permissible noise level of 65 dB(A) may be exceeded under emergency conditions or with [regulatory] approval if written permission is first obtained by the lessee from all residents within 0.8 km (one-half mile)."*

Geothermal resource exploration/testing involves well drilling and less invasive approaches such as geophysical remote sensing. Remote sensing can refine well targeting and reduce the number of wells drilled. The exploration/testing approach is generally identified in a reservoir management plan.

a) Use as few drill sites as is feasible so that fewer people are noise-impacted.

b) Locate the sites as far from residences as possible. In addition, use terrain, such as ridges, and plan the drill site so that noise is projected away from residences, to shield noise impacts to the greatest extent possible. Within two miles of existing, occupied residences, consider restricting geothermal well drilling or major facility construction activities to non-sleeping hours (7 a.m. to 10 p.m.).

c) To dampen drilling rig noise, install acoustical windows in structures occupied by affected parties.

d) Install adequate noise abatement equipment during construction and operation, and maintain it in good condition to reduce noise from any drilling or producing geothermal well located within 1,500 feet of a habitation, school or church. Examples of such equipment include temporary noise shields, cyclone silencers, rock wall mufflers, and sound insulation in pipes. Silencers slow the velocity of steam in the steam processing facility.

Soils and Drainage

a) Do not use geothermal fluids or exploratory well drilling muds for dust control on access roads, well pads, or within the facility area.

Water/Brine Injection and Water Supply

If geothermal power plants are properly designed and sited, water supply and well injection issues can be addressed. Flash geothermal power plants can satisfy up to 95 percent of their water supply needs, including cooling tower make-up water, by recycling steam condensed from produced geothermal brine (CE Obsidian Energy LLC 2009). Water-cooled binary power plants require an external source of cooling water because the brine remains within a closed-loop system until injected. The brine may include concentrated amounts of contaminants which would present problems to the cooling system and the environment. Use of dry cooling or non-potable or degraded surface or groundwater would protect potable water supplies. Dry cooling can reduce the efficiency or electrical energy output of the power plant by as much as 50 percent in hot weather.

The quality of underground sources of drinking water can be protected through careful well and casing design. Contamination of groundwater aquifers could be caused by up flow through a fault or by leakage of the injected fluid behind the casing due to a poor cement bond or through a casing damaged by corrosion or mechanical causes.

Hydraulic fracturing, widely known as hydrofracking, is a well stimulation process that, if used, promotes subsurface fracture systems to facilitate the movement of the underground energy source—in this case geothermal fluid—from rock pores to production wells. Hydraulic fluids, typically consisting of water and chemical additives, are pumped into geological formation at high pressures. Once pressure is sufficient, the hydraulic fluid, or flowback fluid, will rise to the surface. Potential impacts associated with hydrofracking include the use of high volumes of water, potentially degrading local water resources, and the discharge of hydraulic fluid containing chemical additives that may result in contamination of groundwater and surface waters. Flowback water is either discharged to surface waters, regulated under the National Pollutant Discharge Elimination System (NPDES) program, or injected into the ground, regulated by the EPA or state Underground Injection Control (UIC) program. Currently, EPA is preparing a new study to evaluate the potential impacts of hydrofracking on drinking water and public health. The purpose of the study is to address recent concerns related to hydrofracking fluid and to update the findings of an EPA study that resulted in the exemption of hydrofracking fluid from regulation under the Safe Drinking Water Act UIC program (EPA 2011). Mitigation measures may include groundwater level and quality monitoring, as well as obtaining and complying with criterion set forth in applicable permits.

Geothermal operations may result in water loss through evaporation. Evaporative losses may vary from 5 to 33 percent (Clark 2010). Binary cycle geothermal power plants typically have lower evaporative losses (5 percent). To mitigate impacts associated with evaporative water losses, appropriate technologies, such as binary cycle, may be implemented.

Water/Brine Injection Well Best Management Practices

a) Begin planning for injection early in the field development stage. Prepare a preliminary injection strategy as soon as the first few exploration and production wells have been drilled and tested.

b) Use tracer testing and numerical modeling of the reservoir to develop an optimum injection strategy (disappointing production wells should not necessarily be converted to injection wells).

c) Prevent injection pressure buildup with proper chemical treatment and/or filtering of the injection fluid to prevent scaling and/or plugging of injection wells.

d) Increase the spacing between injection wells, or the number of injection wells, to redistribute the total amount of injection over a larger area and thereby correct for ground heaving.

e) Avoid locating injection wells near known active faults and do not allow injection pressure to exceed original pore pressure to avert induced seismicity.

f) Design wells with casing that run from the surface to the depth below the underground source of drinking water. A well should have two casing strings; each sealed its entire length. Test casings, cements, and other materials before selecting them for use in construction at the specific well site.

g) At shallow depths, include multiple casing strings in geothermal wells.

h) If injecting under pressure, monitor injection pressures to avoid excessive pressure and minimize likelihood of injection-induced seismic activity from increased subsurface pressure and the stresses on the injection well equipment.

i) Inject at a rate that will not cause a pressure build-up in the formation or result in reduced fluid temperature at production wells. Monitor injection rates along with pressure monitoring to assess and ensure casing integrity.

j) Design and construct cellars around the casing wellhead. Keep these cellars dry or well drained to prevent corrosion of the casing at the soil-air-water interface.

k) Monitor well integrity to prevent unintended release from within the well to the surrounding formations and interzonal migration of fluids between the casing and the formation.

l) Observe surface conditions daily for casing leaks.

m) If an injection well penetrates an underground source of drinking water, perform mechanical integrity testing periodically to detect actual and potential leaks, casing failures, and cementing problems. Perform these tests prior to initial injection, after well workovers and repairs, and on a routine schedule during normal operations.

Water Supplies Best Management Practices

The use of surface or ground water for cooling a geothermal facility must be thoroughly evaluated and impacts mitigated. This assessment may result in lengthy delays of permitting timeframes.

a) For flash-steam cycle plants minimize the use of fresh water by using geothermal fluid as the major source of cooling water. Use high-efficiency fills in cooling towers to enhance air-to-water contact.

b) For binary geothermal plants, use air-cooled condensers only, during fall, winter and spring (October through April). During the summer season (May through September), plant electrical efficiency can be improved by using one of the following pre-cooling strategies:

   a. Direct deluge cooling of the air-cooled condenser tubes. Add a purified water rinse to wash away new forming scale when the deluge system is shut down for the winter.

   b. Spray-cooling enhancement (that is, pre-cooling with spray nozzles capable of creating micron-sized water droplets).

   c. Honey-comb, porous evaporative-cooling media (for example, Munters media). Use degraded or reclaimed water sources for geothermal-source water supplies as much as possible. Minimize use of fresh or potable water supplies.

Sufficient water supply (for construction, cooling, geothermal makeup water, etc.) must be guaranteed by an applicant before the lease can be approved. The Applicant may need a Conditional Use Permit (CUP) approved by Inyo County to present to BLM before any lease would be granted. Water consumption and use would be evaluated during the NEPA process at the project level.

Monitoring

The mitigation measures, lease stipulations, conditions of approval, and the construction, operation, maintenance, and reclamation of the geothermal developments, will be monitored to ensure their continued effectiveness and compliance through all phases of the project. When compliance is determined to be ineffective, the BLM will take steps to determine the cause and require the operator to take corrective action which may include stopping operations until compliance is restored as determined by the Authorized Officer.

CHAPTER 3

AFFECTED

ENVIRONMENT

THIS PAGE INTENTIONALLY LEFT BLANK.

TABLE OF CONTENTS

LIST OF TABLES:

LIST OF FIGURES:

CHAPTER 3 AFFECTED ENVIRONMENT

This chapter describes the existing conditions of the physical, biological, cultural, and socioeconomic resources that have the potential to be affected by activities related to the alternatives discussed in Chapter 2. These resources include: air quality, climate, sounds, topography, geology, seismicity, soils, water, plants, animals, cultural resources, historical and prehistoric sites, paleontology, view sheds, lands and realty, health and safety, energy, minerals, wild horses and burros, grazing, recreation, and transportation. The resources that occur within the project area, or are adjacent to or otherwise associated with the area, have been included with those resources identified during the scoping process and in the BLM interdisciplinary team review. More detailed information on existing conditions for air quality, biological, cultural, and paleontological resources is documented in technical reports to be found in the Appendices. The resources and baseline conditions described here represent the current conditions of the environment that the HGLA program alternatives could affect. The impact assessment in Chapter 4, Environmental Consequences, focuses on these same resources and baseline conditions.

3.1 INTRODUCTION AND OVERVIEW

3.1.1 Geographic Setting

The Haiwee Geothermal Leasing Area (HGLA) encompasses 38 sections, but BLM responsibility does not include the one section of State of California land (Township 21 South, Range 38 East, Section 16, MDM). The HGLA is primarily undeveloped desert lands within a sparsely populated area of south-central California. The HGLA is located in the West Mojave Desert of southwestern Inyo County, California (see Figures 1.1-1 and 1.1-2) and includes approximately 22,805 acres of federally managed mineral estate. The HGLA lies in Rose Valley which is topographically separated from the Owens Valley to the north by Dunmovin Hill. These two valleys are bounded by the front range of the Sierra Nevada to the west, and the Coso Range to the east. U.S. Highway 395 (US 395), the primary north-south roadway through the valleys, provides the primary access to the HGLA from southern California and northern Nevada. In contrast, the local road network in the vicinity of the HGLA consists of a few secondary roads. The Sykes-Gill Station Road (also called the Coso-Gill Station Road) at Coso Junction provides access to the interior of the HGLA (see Figure 1.1-3 and Appendix I).

The HGLA is isolated from the major economic hubs such as Bakersfield, a two-hour drive to the west, and Los Angeles or Las Vegas, each located approximately a four-hour drive from the HGLA. There are a number of small, unincorporated communities along the US 395 corridor north and south of the HGLA. Two incorporated cities in the general vicinity of the HGLA are Ridgecrest and California City, both located to the south in northeast Kern County. Independence, the seat of Inyo County, is located 50 miles to the north of the HGLA. Other small, unincorporated communities in the vicinity include Haiwee, Olancha, Dunmovin, Coso Junction, and Little Lake. Coso Junction is within the HGLA.

To the east of the HGLA is the China Lake Naval Air Weapons Station (NAWS), a federal 1.1 million-acre installation with a mission of weaponry research, development testing and evaluation, and weapons training. NAWS includes housing facilities for staff, military personnel and visitors. The 606,000-acre North Range of the NAWS adjoins the eastern portions of the HGLA.

To the north of the HGLA, in the Owens Valley, are the North and South Haiwee Reservoirs. The Los Angeles Department of Water and Power (LADWP) own and operate these reservoirs along with the two associated Los Angeles aqueducts.

The privately owned Little Lake Ranch is located at the southern end of Rose Valley. Little Lake Ranch is a 1,200-acre area to the north of the 90-acre Little Lake, which includes a number of smaller ponds and wetlands.

The Coso Geothermal Area, located to the southeast of the HGLA, is an existing geothermal power plant complex located within the China Lake NAWS. As of January 2010, re-injection water for the Coso Geothermal complex is being provided via a new pipeline in the northern Rose Valley, from the Hay Ranch (see Figure 1.1-3). The supply wells for this water are located on private land within the interior of the HGLA. This water re-injection system recharges water needed for operations of the Coso geothermal reservoir.

Over ninety percent of the lands in Inyo County are federally owned, with less than two percent in private ownership. This pattern is reflected in the HGLA where over 90 percent of the total of 24,320 acres is federally owned and administered by the BLM. One section (640 acres) of land within the HGLA is administered by the California State Lands Commission. No National Forest or designated wilderness area lands are located on or adjacent to the HGLA.

3.2 AIR QUALITY AND CLIMATE

3.2.1 Applicable Regulations, Plans, Policies/Management Goals

The Clean Air Act (CAA) establishes air quality planning processes and requires areas in nonattainment of a National Ambient Air Quality Standard (NAAQS) to develop a State Implementation Plan (SIP) that details how the state will attain the standard within mandated time frames. The requirements and compliance dates for attainment are based on the severity of the nonattainment classification of the area. The national and state ambient air quality standards are shown in Table 3.2-1.

The following summarizes the air quality rules and regulations that apply to the HGLA.

Federal Regulations

Section 176(c) of the CAA, as articulated in the United States Environmental Protection Agency (USEPA) General Conformity Rule (40 CFR 93), states that a federal agency cannot issue a permit for, or support, an activity unless the agency determines that it will conform to the most recent USEPA-approved SIP. This means that projects using federal funds or requiring federal approval must not (1) cause or contribute to any new violation of a NAAQS, (2) increase the frequency or severity of any existing violation, or (3) delay the timely attainment of any standard, interim emission reduction, or other milestone. The HGLA is primarily within the federal Coso Junction PM_{10} Planning area which is classified as a federal attainment/maintenance area for PM_{10}. A very small area on the northern boundary of the HGLA is within the Owens Valley PM_{10} Planning area. The Owens Valley Planning area is classified as a serious nonattainment area for PM_{10} by the USEPA. These classifications necessitate a conformity analysis for both of these planning areas. The HGLA is currently in attainment of all of the other NAAQS.

State Regulations

The California Air Resources Board (CARB) has oversight over air quality in the state of California. Regulation of individual stationary sources and area sources has been delegated to local air pollution control agencies. CARB is responsible for developing programs designed to reduce emissions from mobile sources, including motor vehicles and off-road equipment.

CARB and the California Office of Environmental Health Hazard Assessment (OEHHA) are also responsible for developing regulations governing toxic air contaminants (TACs). TACs include air pollutants that can cause serious illnesses or increased mortality, even in low concentrations. CARB and the OEHHA identify specific air pollutants as TACs, develop health thresholds for exposure to TACs, and develop guidelines for conducting health risk assessments for sources of TIC emissions.

Table 3.2-1 National and California Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards	Primary National Standards [a,b,c]	Secondary National Standards [a,b,d]
Ozone (O_3)	8-hour	0.070 ppm (137 µg/m^3)	0.075 ppm (147 µg/m^3)	Same as primary
	1-hour	0.09 ppm (180 µg/m^3)	—	—
Carbon monoxide (CO)	8-hour	9.0 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	—
	1-hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	—
Nitrogen dioxide (NO_2)	Annual	0.030 ppm (56 µg/m^3)	0.053 ppm (100 µg/m^3)	Same as primary
	1-hour	0.18 ppm (338 µg/m^3)	—	—
Sulfur dioxide (SO_2)	Annual	—	0.030 ppm (80 µg/m^3)	—
	24-hour	0.04 ppm (105 µg/m^3)	0.14 ppm (365 µg/m^3)	—
	3-hour	—	—	0.5 ppm (1,300 µg/m^3)
	1-hour	0.25 ppm (655 µg/m^3)	—	—
PM_{10}	Annual	20 µg/m^3	—	—
	24-hour	50 µg/m^3	150 µg/m^3	Same as primary
$PM_{2.5}$	Annual	12 µg/m^3	15.0 µg/m^3	
	24-hour	—	35 µg/m^3	
Lead	Rolling 3-month period	—	0.15 µg/m^3	Same as primary
	Calendar Quarter	—	1.5 µg/m^3	Same as primary
	30-day average	1.5 µg/m^3	—	—
Hydrogen Sulfide	1-hour	0.03 ppm (42 µg/m^3)	—	—
Visibility Reducing Particles	8 Hour	Extinction coefficient of 0.23 per kilometer – visibility of ten miles or more due to particles where relative humidity is less than 70 percent[1].	None	None
Sulfates	24 Hour	25 µg/m^3	None	None
Vinyl Chloride	24 Hour	0.01 ppm (26 µg/m^3)	None	None

Source: California Air Resources Board. 2010. Ambient Air Quality Standards Chart: http://www.arb.ca.gov/research/aaqs/aaqs2.pdf

Notes: µg/m^3=micrograms per cubic meter

(a) Standards other than the 1-hour ozone, 24-hour PM_{10}, 24-hour $PM_{2.5}$, and those based on annual averages are not to be

exceeded more than once a year. The 8-hour ozone national standard has replaced the 1-hour ozone national standard.
(b) Concentrations are expressed first in units in which they were promulgated. Equivalent units given in parenthesis.
(c) Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health. Each state must attain the primary standards no later than three years after that state's implementation plan is approved by the USEPA.
(d) Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
(1) Method: Beta Attenuation and Transmittance through Filter Tape.

Local Regulations

The HGLA is located in the jurisdiction of the Great Basin Unified Air Pollution Control District (GBUAPCD). The GBUAPCD is responsible for regulating stationary and area sources of air emissions in the HGLA. Stationary sources, such as geothermal plants, and area sources such as construction and off highway travel that have the potential to emit air pollutants into the ambient air are subject to the rules and regulations adopted by the GBUAPCD.

The GBUAPCD prepared its PM_{10} *Maintenance Plan and Redesignation Request for the Coso Junction Planning Area (CJPL),* which was adopted by the Governing Board on May 17, 2010. The plan was approved by the USEPA September 3, 2010. As part of that approval by the USEPA, the CJPL was redesignated as a maintenance area for PM_{10}. The SIP indicated that maintenance of the PM_{10} standard for the CJPL is dependent on emission reductions in the Owens Valley PM_{10} Planning area. The plan also indicates that local sources within the CJPL do not have a significant impact on PM_{10} concentrations in the CJPL.

In addition to concerns regarding PM_{10}, the GBUAPCD monitors hydrogen sulfide (H_2S) within the region including the HGLA. H_2S occurs in the geothermal fluids at the Coso Geothermal plant. The Coso plant employs a scrubber to remove sulphur from the fluids. Any development within the HGLA would be required to obtain necessary permits and approval from GBUAPCD. Hydrogen sulfide "is now routinely abated at geothermal power plants, resulting in the conversion of over 99.9 percent of the hydrogen sulfide from geothermal noncondensable gases into elemental sulfur, which can then be used as a non-hazardous soil amendment and fertilizer feedstock." (Kagel, Bates, Gawell, 2005)

Resource Overview

Air quality is defined by ambient air concentrations of specific pollutants determined by the USEPA to be of concern with respect to the health and welfare of the general public. Ambient air quality refers to the atmospheric concentration of a specific compound (amount of a pollutant in a specified volume of air) that occurs at a particular geographic location. Emissions, meteorology, and chemistry affect the ambient air quality levels measured at a particular location.

Pollutant emissions typically refer to the amount of pollutants or pollutant precursors introduced into the atmosphere by a source or group of sources. Pollutant emissions contribute to the ambient air concentrations of criteria pollutants, either by directly affecting the pollutant concentrations measured in the ambient air or by interacting in the atmosphere to form criteria pollutants.

Pollutants are defined as two general types: (1) "criteria" pollutants and (2) toxic compounds. Criteria pollutants have national and/or state ambient air quality standards. The USEPA establishes the NAAQS, while CARB establishes the state standards, termed the California Ambient Air Quality Standards (CAAQS).

Criteria Pollutants

Seven major pollutants of concern, called "criteria pollutants," are carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), PM_{10}, fine particulate matter less than or equal to 2.5 μm in diameter ($PM_{2.5}$), and lead (Pb). The USEPA has established NAAQS for these pollutants.

Toxic Air Contaminants (TAC)

TACs are substances that have the potential to be emitted into the ambient air and have been determined to present some level of acute or chronic health risk (cancer or non-cancer) to the general public. These pollutants may be emitted in trace amounts from various types of sources, including combustion sources.

Greenhouse Gas Emissions (GHG)

GHGs are gases that trap heat in the atmosphere. These emissions occur from natural processes as well as human activities. The accumulation of GHGs in the atmosphere impact the earth's temperature. Scientific evidence indicates a trend of increasing global temperature over the past century, which a number of scientists attribute to an increase in GHG emissions from human activities. The climate change associated with this global warming is predicted to produce negative economic and social consequences across the globe.

The most common GHGs emitted from natural processes and human activities include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Each GHG is assigned a global warming potential. The global warming potential is the ability of a gas or aerosol to trap heat in the atmosphere. The global warming potential rating system is standardized to CO_2, which has a value of one. For example, CH_4 has a global warming potential of 21, which means that it has a global warming effect 21 times greater than CO_2 on an equal-mass basis. Total GHG emissions from a source are often reported as a CO_2 equivalent (CO_2e). The CO_2e is calculated by multiplying the emission of each GHG by its global warming potential and adding the results together to produce a single, combined emission rate representing all GHGs. On a national scale, federal agencies are addressing emissions of GHGs by reductions mandated in federal laws and Executive Orders. Most recently, Executive Order 13423 Strengthening Federal Environmental, Energy, and Transportation Management (January 24, 2007) was enacted. Several states have promulgated laws as a means to reduce statewide levels of GHG emissions. In particular, the California Global Warming Solutions Act of 2006 directs the State of California to reduce statewide GHG emissions to 1990 levels by the year 2020. It is important to note that CO_2 emissions from geothermal energy power facilities are insignificant in comparison to those from fossil fuel power facilities.

The potential effects of proposed GHG emissions are by nature global, and have cumulative impacts. However, the current state of the science does not allow the measurement or analysis of the climate change impacts that might be associated with GHG emissions from a particular project on a localized or even global level. The Air Resources Management Program Manual (BLM 2009) contains the BLM's guidance on incorporating assessment of climate change issues into BLM planning and NEPA documents. The guidance requires that air resource management programs consider and analyze potential climate change impacts when undertaking long-range planning exercises, setting priorities for scientific research and investigations, and/or when making major decisions affecting resources. The BLM guidance was followed in evaluating potential impacts on global climate.

3.2.2 Regional Climate

The climate of the HGLA is classified as high desert climate characterized by dry, hot summers and cool winters. The major influences on the regional climate are the Eastern Pacific high pressure system, the Sierra Nevada mountain range to the west, and the mountain ranges to the east of the HGLA.

The Western Regional Climate Center (WRCC 2009) archives weather data for the western US. Data is available for the Haiwee Reservoir Area, located on the north side of the study area, for the period since May 1, 1923. Data through April 30, 2009 was used in this EIS. The Haiwee weather station monitors temperature, precipitation (including snowfall). Monthly average temperatures and precipitation for the HGLA are summarized in Table 3.2-2.

Table 3.2-2 Monthly Average Temperatures and Precipitation – Haiwee Meteorological Station

Month	Temperature, °F				Precipitation, Inches	
	Maximum	Standard Deviation	Minimum	Standard Deviation	Measurement	Standard Deviation
January	51.71	5.09	29.00	4.38	1.05	1.44
February	56.51	4.44	32.58	3.78	1.30	1.51
March	62.89	4.74	37.16	3.26	0.87	1.07
April	70.38	4.45	43.53	4.08	0.34	0.52
May	79.52	4.56	51.44	3.68	0.22	0.36
June	88.88	3.74	59.15	3.19	0.10	0.21
July	95.48	2.99	65.82	3.40	0.23	0.49
August	93.81	2.97	63.89	2.99	0.29	0.56
September	86.72	3.07	57.14	3.45	0.28	0.53
October	75.65	4.04	47.15	3.27	0.27	0.72
November	62.02	3.85	36.50	3.06	0.56	0.97
December	52.60	3.95	30.06	2.98	0.95	1.14
Annual	**72.87**	**1.86**	**46.35**	**2.10**	**6.55**	**3.55**

Source: http://www.wrcc.dri.edu/CLIMATEDATA.html

The mean annual temperature for the Haiwee monitoring station is 59.36 degrees Fahrenheit (°F) with a standard deviation of 0.98 °F. The long-term trend in temperatures at the Haiwee monitoring station is down about one degree since the 1920s. An analysis of the Haiwee temperature data from 1924 (first year with complete data) to 2009 shows that the five-year mean temperature has declined over the last 10 years, and is currently below the long-term mean temperature.

The mean precipitation for the Haiwee monitoring station is 6.55 inches. The precipitation has ranged between 17.27 and 1.85 with a standard deviation of 3.58 inches. The data show that the precipitation is not equally distributed throughout each month of the year and falls mostly in the winter cool season. In the 2007 water year, there was little rainfall (0.95 inches) which is about 14% of normal. The rainfall in water year 2008 was 1.91 inches which is 28% of normal.

3.2.3 Existing Conditions

The HGLA is located within the Great Basin Valleys Air Basin (GBVAB), which encompasses Alpine, Mono, and Inyo Counties. The GBUAPCD administers oversight of the air quality in the GBVAB.

The GBUAPCD operates a series of ambient air quality monitoring stations throughout the Great Basin Valleys Air Basin. The closest monitoring sites to the HGLA are located in

Olancha and Coso Junction. The Olancha monitoring station only measures PM_{10}, and the Coso Junction monitoring station measures PM_{10} and H_2S. H2S is monitored in the Coso Junction area due to concerns regarding emissions from geothermal plants. The only monitoring station in the GBVAB that measures ozone is located in Death Valley National Park to the east of the site. However, ozone concentrations at the Death Valley monitoring station are likely to be representative of site conditions, as ozone levels in the region are usually the result of transport rather than localized emissions, and ozone is considered a basin-wide pollutant. The only monitoring station in the GBVAB that measures $PM_{2.5}$ is located at Keeler, near Owens Lake to the north of the HGLA; this monitoring station likely experiences higher levels of $PM_{2.5}$ than the HGLA. CO, NO_2, and SO_2 are not monitored within the Great Basin Valleys Air Basin and are not considered to be of concern with regard to attainment of the ambient air quality standards.

Table 3.2-3 provides a summary of background air quality representative of the HGLA.

Table 3.2-3 Representative Air Quality Data for the HGLA (2004-2008)

Air Quality Indicator	2004	2005	2006	2007	2008
Ozone (O_3) [(1)]					
Peak 1-hour value (ppm)	0.086	0.105	0.092	0.107	0.098
Days above state standard (0.09 ppm)	0	1	0	3	1
Peak 8-hour value (ppm)	0.081	0.101	0.088	0.094	0.094
Days above state standard (0.070 ppm)	28	47	33	35	21
Days above federal standard (0.075 ppm)[(2, 6)]	9	24	9	18	5
Particulate matter less than or equal to 10 µm in diameter (PM_{10}) [(3)]					
Peak 24-hour value (µg/m³)	409	67	92	114	357
Days above state standard (50 µg/m³)	2	2	2	2	*
Days above federal standard (150 µg/m³)	1	0	0	0	5
Annual Average value (ppm)	24.4	22.3	21.9	21.5	22.3
Particulate matter less than or equal to 10 µm in diameter (PM_{10}) [(7)]					
Peak 24-hour value (µg/m³)	66	97	77	283	137
Days above state standard (50 µg/m³)	2	2	1	*	*
Days above federal standard (150 µg/m³)	0	0	0	2	0
Annual Average value (ppm)	15.1	18.9	14.3	19.4	18.4
Particulate matter less than or equal to 2.5 µm in diameter ($PM_{2.5}$) [(4)]					
Peak 24-hour value (µg/m³) [(5)]	81	22	193	57	58
Days above federal standard (35 µg/m³)	1	0	1	2	4
Annual Average value (ppm)	*	*	*	5.8	7.1
Hydrogen Sulfide (H_2S) [(7)]					
Peak 1-hour value (ppm)	0.007	0.005	0.003	0.003	0.003
Days above state standard (0.03 ppm)	0	0	0	0	0

Source: CARB. 2010. ADAM Air Quality Data Statistics. http://www.arb.ca.gov/adam/topfour/topfourdisplay.php

Notes: (1) Data from the Death Valley monitoring station.

(2) The federal ozone standard was revised downward in 2008 to 0.075 ppm.

(3) Data from the Olancha monitoring station.

(4) Data from the Keeler monitoring station.

(5) The federal $PM_{2.5}$ standard was revised downward in 2007 to 35 µg/m³.

(6) The federal eight-hour ozone standard was previously defined as 0.08 ppm (1 significant digit). Measurements were rounded up or down to determine compliance with the standard; therefore a measurement of 0.084 ppm is rounded to 0.08 ppm. The 8-hour ozone ambient air quality standards are met at an ambient air quality monitoring site when the average of the annual fourth-highest daily maximum 8-hour average ozone concentration is less than or equal to the standard.

(7) Data from the Coso Junction monitoring station.

ppm = parts per million; µg/m³ = micrograms per cubic meter; * = not available

3.2.4 Compliance with Air Quality Standards

The GBVAB is considered an unclassified/attainment area for the NAAQS for ozone, CO, NO_2, $PM_{2.5}$, and SO_2. In the area of the HGLA, the Owens Valley is classified as a serious nonattainment area for the NAAQS for PM_{10}, and the Coso Junction area is classified as a maintenance area for the NAAQS for PM_{10}.

The USEPA is proposing to lower the 8-hour ozone standard to within a range of 0.060 and 0.070 ppm. The ambient air monitoring station at Death Valley measures 8-hour ozone concentrations above this level, and its three-year average 8-hour ozone concentration is 0.081 ppm. This level is above both the current standard and the proposed lower standard for ozone. In January 2009, the GBUAPCD recommended to CARB that southeast Inyo County be redesignated as an ozone nonattainment area since 65 exceedances of the 8-hour NAAQS of 0.075 ppm were recorded. In response, CARB has recommended to the USEPA that the region be redesignated as an ozone nonattainment area. Should this occur, the GBUAPCD will be required to develop an air quality management plan for ozone. The GBVAB is considered an unclassified/attainment area for the CAAQS for CO, NO_2, $PM_{2.5}$, and SO_2. Inyo County is considered an unclassified area for the 1-hour CAAQS for ozone, but Mono and Inyo Counties are classified as nonattainment areas for the 8-hour CAAQS for ozone. The air basin is a nonattainment area for the CAAQS for PM_{10}. Table 3.2-4 shows Inyo County's attainment status with regard to the CAAQS and NAAQS.

Table 3.2-4 HGLA Attainment Status

Standard	CAAQS Attainment Status	NAAQS Attainment Status
O_3 – 1-hour	Unclassified	Unclassified/Attainment
O_3 – 8-hour	Nonattainment	Unclassified/Attainment
$PM_{2.5}$ – 24-hour	Unclassified/Attainment	Unclassified/Attainment
$PM_{2.5}$ – Annual	Unclassified/Attainment	Unclassified/Attainment
PM_{10} – 24-hour	Nonattainment	Attainment/Maintenance
PM_{10} – Annual	Nonattainment	Unclassified/Attainment
CO	Unclassified/Attainment	Unclassified/Attainment
NO_2	Unclassified/Attainment	Unclassified/Attainment
SO_2	Unclassified/Attainment	Unclassified/Attainment
Sulfates	Unclassified/Attainment	N/A
Lead	Unclassified/Attainment	Unclassified/Attainment
H_2S	Unclassified/Attainment	N/A
Visibility Reducing Particles	Unclassified/Attainment	N/A

N/A = Not Applicable

Source: USEPA 2010. The Green Book Nonattainment Areas for Criteria Pollutants: http://epa.gov/airquality/greenbk/

3.3 NOISE

3.3.1 Applicable Regulations, Plans, Policies/Management Goals

The Public Safety Element of the Inyo 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 section of the Public Safety Element establishes goals and policies to protect the public from noise intrusion. The noise restrictions for Inyo County are applicable to lands owned or zoned by the county, and lands regulated by the state or federal government. Eight percent of the total area within the HGLA is privately or state-owned land that is subject to the goals and objectives of the noise restrictions of the Public Safety Element of the Inyo County General Plan. Potentially applicable goals and policies include:

- **Goal 1:** Prevent incompatible land uses, by reason of excessive noise levels, from occurring in the future.
    - Policy NOI-1.1 Acceptable Noise Limits - The county shall utilize the noise levels shown in County noise standards for evaluating project compatibility related to noise.
    - Policy NOI-1.2 Exposure to Existing Noise from Stationary Sources - The county shall not allow new development within areas where existing noise levels currently exceed County noise standards, unless mitigation measures would reduce impacts to future occupants.
    - Policy NOI-1.3 Limit Increases in Noise Levels from Stationary Sources - Require that new development not increase the ambient exterior noise level (measured at the property line) above established county noise standards, unless mitigation measures are included to reduce impacts to below county noise standards.
    - Policy NOI-1.5 Implementation of Mitigation Measures - Require that proponents of new projects provide or fund the implementation of noise-reducing mitigation measures to reduce noise to required levels.
    - Policy NOI-1.7 Noise Controls During Construction - Contractors will be required to implement noise-reducing mitigation measures during construction when residential uses or other sensitive receptors are located within 500 feet.
- **Goal 2:** Preserve and maintain a quiet rural environmental character.

- Policy NOI-2.1 Rural Roadways - Maintaining two-lane county roadways is encouraged where feasible. Widening and expansion of county roadway facilities is discouraged unless required to provide necessary capacity.

3.3.2 Affected Environment

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. However, 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 as well as the sensitivity of the individual. Therefore, the "A-weighted" noise scale, which corresponds to the audible frequencies to which humans are sensitive, is used for measurements. Noise levels using A-weighted measurements are typically written as "dB(A)."

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 example. 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 used to establish community noise equivalent levels, and day and nighttime levels.

3.3.3 Existing Conditions

The HGLA is located in a relatively remote desert region of Inyo County dominated by mostly undeveloped federal and state lands. Current uses within this area include recreation, residential, ranching, and mining. The nearest potentially noise-sensitive residential and recreational receptors to the HGLA are sparsely populated areas in Haiwee, areas to the south of Haiwee at Dunmovin and Coso Junction, and the Enchanted Lake Village and the Haiwee Reservoirs, located north of the HGLA. 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. Receptors can include residences, schools, hospitals, parks, trails and other miscellaneous recreational areas, and places of business requiring low levels of noise. Because the BLM-administered lands within the HGLA are situated in a very remote area, sensitive human receptors in or near the HGLA are unlikely.

Ambient noise level measurements for the HGLA are not available. However, based on the existing land uses and environmental conditions, ambient noise levels in the HGLA and vicinity are generally assumed to be low and representative of remote desert areas (i.e., 35 to 50 dB(A)). Potential exceptions due to intermittent noise-generating activities in the vicinity include:

- Noise associated with occasional recreational and support activities in the HGLA and immediate vicinity.
- Noise associated with mining and mineral transport in the HGLA and immediate vicinity.
- Ambient vehicular traffic noise from nearby US 395.
- Periodic noise from mission operations at the nearby China Lake NAWS.
- Noise from off-highway vehicles (OHV) (e.g. motorcycles up to 100 dB(A)).

3.4 TOPOGRAPHY, GEOLOGY AND SEISMICITY

3.4.1 Applicable Regulations, Plans, Policies/Management Goals

The Federal Land Policy and Management Act (FLPMA) and the California Desert Conservation Area (CDCA) Plan, as amended, contain most of the relevant resource management approaches, policies and management goals addressing these resources. The FLPMA states:

> "...responding to national priority needs for resource use and development, both today and in the future, including such paramount priorities as energy development and transmission, without compromising the basic desert resources of soil, air, water, and vegetation, or public values such as wildlife, cultural resources, or magnificent desert scenery."

The most applicable management goal of the CDCA Plan is the identification of potential sites for development of geothermal, wind, and solar generating facilities. The Plan's 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.

3.4.2 Affected Environment

3.4.2.1 Topography

The surface elevation of Rose Valley ranges from 3,200 feet near Little Lake to the south to 3,750 feet near South Haiwee Reservoir to the north. The northern boundary of the valley is formed by merging alluvial fans that descend from the two bounding mountain ranges. Peaks in this portion of the Sierra Nevada Range rise to more than 9,000 feet, and peaks in the Coso Range rise to more than 6,000 feet.

The ground surface of the valley floor generally slopes gently to the south at a rate of 30 to 35 feet per mile. The HGLA is divided nearly equally between the low-lying valley and the higher elevation of the Coso Range. At its lowest point to the south, the HGLA lies 3,300 feet above sea level. The HGLA extends west to 4,200 feet in the Sierra Nevada foot hills, and to above 5,700 feet in the Coso Range to the east. To the north of the HGLA, the Coso Range elevations reach 6,085 feet, and valley elevations average nearly 3,700 feet.

3.4.2.2 Geology

Regional Geology

The HGLA is located at the transition between the extensional Basin and Range geomorphic province and the Eastern California Shear Zone. Geologic units in the vicinity are shown in Figure 3.4-1. The Basin and Range structural province in this area is characterized by northerly trending normal fault block mountains (the Sierra Nevada range to the west and Coso Range to the east) separated by deep alluvial graben valleys. It is an area of high geothermal heat flow and general east-west crustal extension.

The oldest rock exposed in the western Basin and Range province is complexly folded Precambrian, low to middle grade metasediments and metavolcanics (Rockwell 1980). These are intruded by Jurassic to late Cretaceous stocks and plugs. The intrusives range in composition from gabbro to granite, with quartz-monzonite and granodiorite predominating. These small intrusive bodies are believed to be related to, or satellites of, the Sierra Nevada batholith.

The Sierra Nevada batholith is a large continuous exposure of plutonic rocks that represents the exhumed root zone of a subduction-related magmatic arc. The magmatic arc was continuously active for more than 140 million years; however, most crustal magmatism took place during two short-lived episodes, one in the Late Jurassic and a second, more voluminous episode, in the Cretaceous (Ducea 2001). Granitic rocks of the Sierra Nevada Batholith form the core of the Sierra Nevada, Coso Range, and Argus Range (southeast of the Coso Range), and probably underlie the basement fill of Rose Valley. The Coso and Argus Ranges are primarily composed of various plutons of Jurassic quartz monzonites and granites.

The Mesozoic igneous and metamorphic core of the Coso Range is overlain by late Cenozoic volcanics that occurred in two periods. Older bimodal (basaltic and rhyolitic) volcanic eruptions are overlain by younger rhyolitic domes and related flows, and pyroclastic deposits. The youngest of these comprises Sugarloaf Mountain in the Coso Geothermal Field. This volcanism also reaches the eastern edge of the HGLA. The source of the younger volcanics appears to be a crystal magma reservoir that lies beneath the center of the Coso geothermal field (Wilson, et al. 2003).

Local Geology

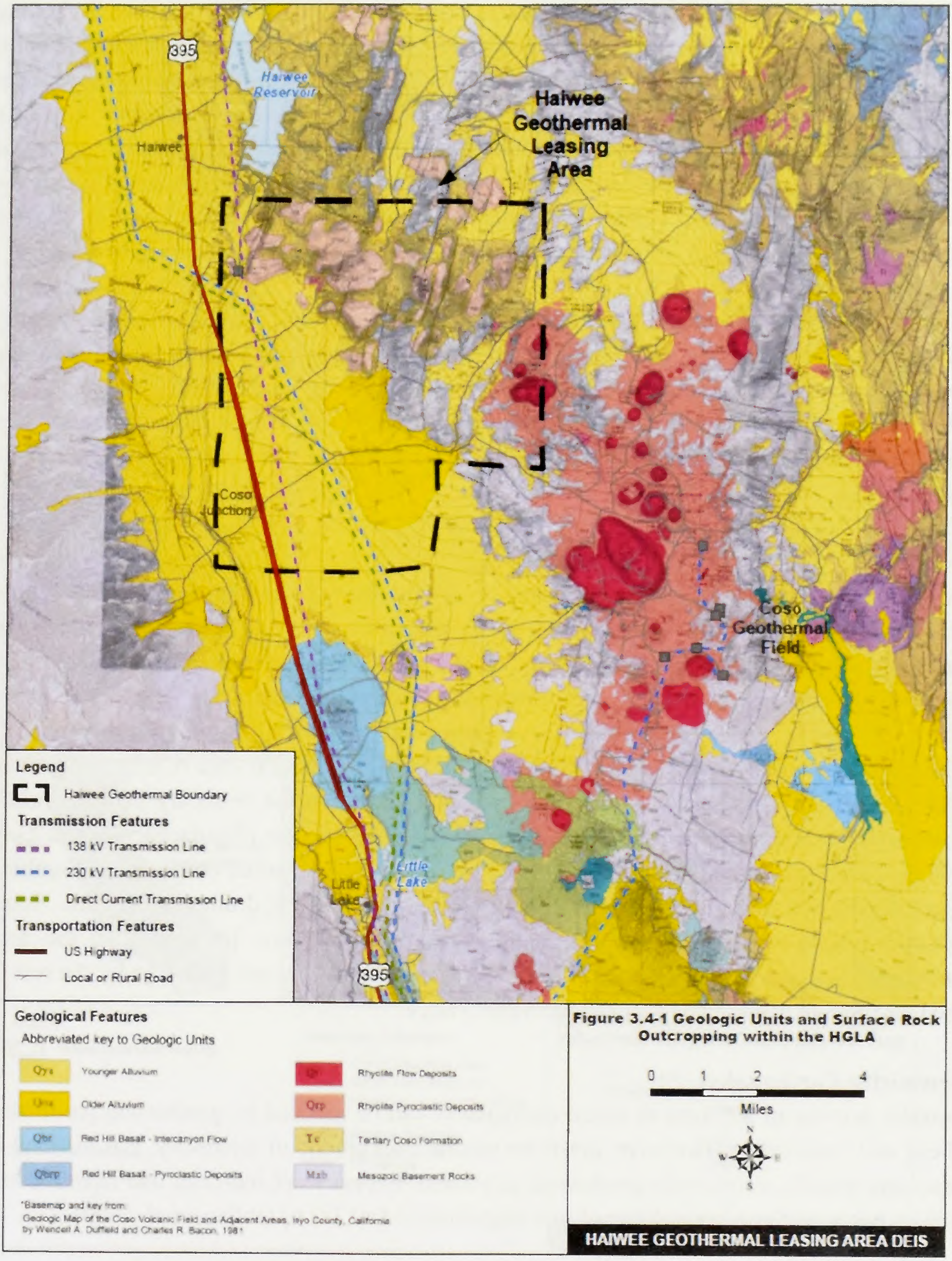
The HGLA includes two primary geomorphic provinces: Rose Valley and the Coso Range. The specific rock types and stratigraphy, and the structure and faulting of each area, are described below.

Rose Valley is a *graben* surrounded and underlain by igneous and metamorphic basement rocks of the Sierra Nevada and Coso Ranges, and filled with locally derived sediments and minor volcanics. The depth of sediment accumulation also reflects the vertical displacement along the valley-bounding faults.

Alluvial sediments were encountered to depths as great as 3,489 feet in borings in the north central portion of the basin (Schaer 1981), and may extend to depths greater than 5,000 feet below ground surface (bgs) based on gravity surveys (GeoTrans 2004). Outcrops east of the central and northern Rose Valley are younger volcanic rocks (30 to 0.4 million year-old) of the Coso Range and are predominately rhyolitic, dacitic, and andesitic in composition.

The southern boundary of the Rose Valley groundwater basin is marked by outcrops of volcanic rocks related to eruptions within, or to flows from the Coso Range and volcanic cinder cones in the Red Hill area. The flows, which form the eastern boundary of Little Lake, came from a vent on the southwest edge of the Coso Range. (Refer to Figure 3.4-1)

Figure 3.4-1 Geologic Units and Surface Rock Outcropping within the HGLA



3.4.2.3 Tectonic and Seismic Setting

The HGLA is located in an tectonically active transitional zone between the normal faulting extension characteristic of the Basin and Range Province to the north and east, and the north and west-southwest oriented strike-slip faulting of the Eastern California right lateral shear zone, represented by the Garlock fault to the south. This active tectonic stress is characterized by localized crustal extension in a releasing step-over fault between two major strike slip faults, and may act as an accommodation zone between the two tectonic regimes (Wilson, et al. 2003). Earthquakes are generated as a result of the tectonic stress, and the region in which the HGLA is located is one of the most seismically active in California.

This complex seismotectonic setting has produced a series of active faults within the vicinity of the HGLA. The faulting pattern in the area is related to the transitional tectonics. Faulting in the Coso Range is dominated by north to northeast striking normal faults, or right-lateral oblique-slip extensional faults with limited surface expression. Major faults in the vicinity include the Owens Valley Fault, the Sierra Nevada Fault Zone, the Little Lake Fault and the Airport Lake Fault (Figure 3.4-2).

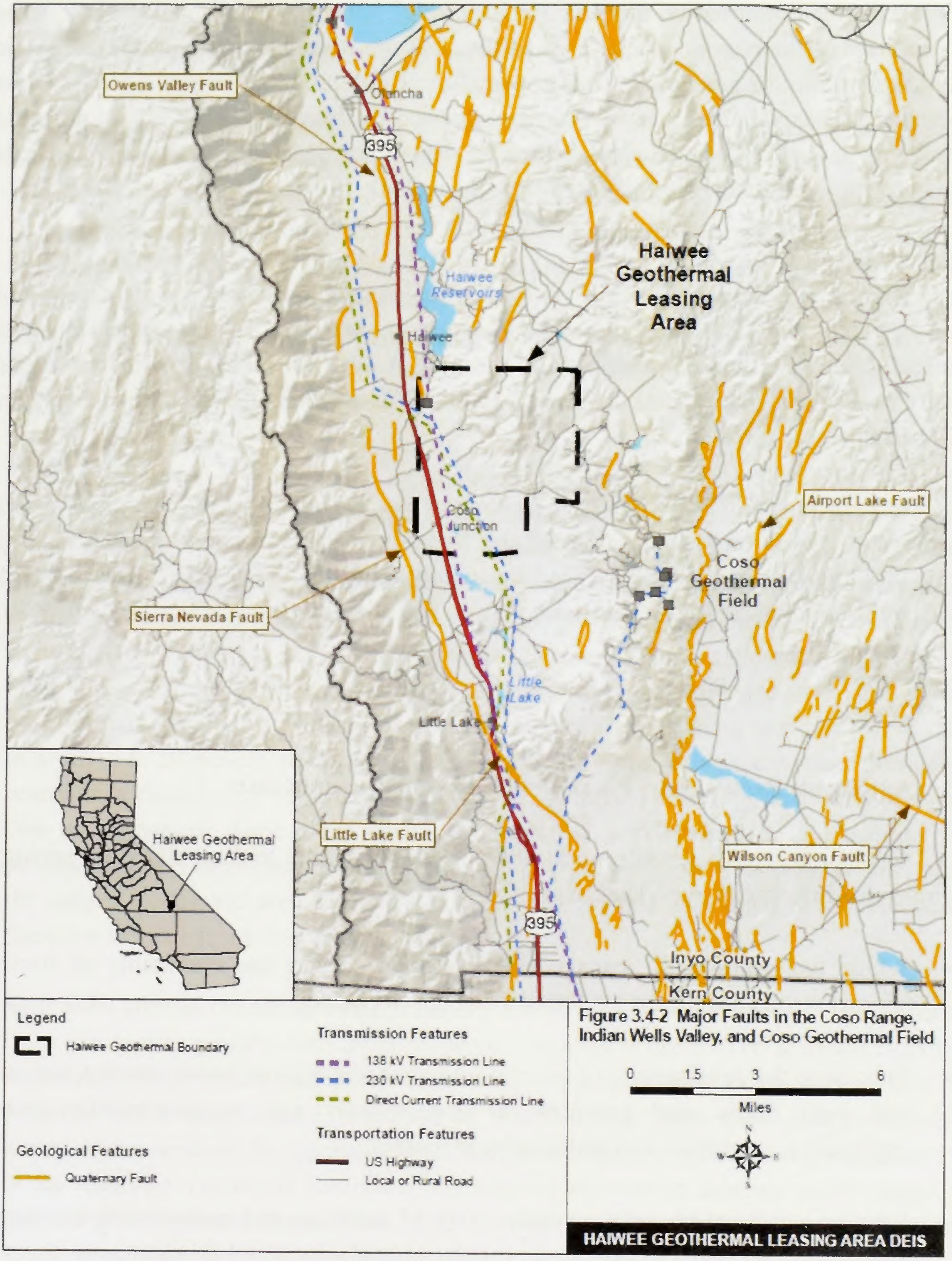
Seismic interpretation of local earthquake data (Unruh, et al. 2001) indicates this extension of brittle granitic rocks generates permeability within the geothermal field. This brittle fractured zone is underlain at 2.5 to 3.1 miles beneath the surface by the transition from brittle to ductile extension. Related magmatism provides the heat source for the actively exploited geothermal field at Coso, southeast of the area of interest.

The crustal structure, recent volcanism combined with geochemical data (Christenson, et al. 2007) suggests the presence of a rhyolitic magma chamber at the boundary between brittle rocks and ductile rocks at 2.5 to 3.8 miles beneath the surface (Bhattacharyya and Lees 2002). This semi-liquid zone erupted to form the most recent rhyolitic domes in the Southern Coso Range, and probably provides the heat source for the Coso hydrothermal system. Some seismic evidence suggests that this magma chamber may now be limited to the area underlying the currently exploited Coso geothermal area and may not extend under the rest of the Coso Range, Rose Valley, or Indian Wells Valley.

Seismicity-Earthquakes

Seismic activity in the form of micro-earthquakes can be induced by geothermal production (Feng and Lees 1998). However, given the natural background of seismicity, it is difficult to associate specific events with geothermal activities. Recent work indicates that injection can induce micro earthquakes at Coso of low magnitude (M=0.3-2.6) (Julian, et al. 2009).

Figure 3.4-2 Major Faults in the Coso Range, Indian Wells Valley, and Coso Geothermal Field



Most earthquakes in the Coso-Rose Valley-Indian Wells Valley region are small, with a magnitude (M) of <3.0. Large earthquakes (M>4.9) have been recorded about every 20 years until 1995 (1938, 1961, 1982, and 1995) with the most recent being the 1995 "Ridgecrest" Earthquake which occurred on the Airport Lake fault. After 1995, four major earthquakes have occurred in the region. These large earthquakes are related to fault movement. Most earthquakes within the geothermal field are smaller. Until 2002, the largest recorded event within the geothermal field was M=3.5 that occurred on May 10, 1998; it was probably related to the large Coso Range earthquake at the same time. Seismicity in both Indian Wells Valley and the Coso Range has increased since the major earthquakes of the mid-1990s.

Magmatism

The southern Coso Range includes a young volcanic zone containing volcanic domes and flows 4,000,000 to 40,000 years old. The youngest of these is a rhyolite dome known as Sugarloaf Mountain, located southeast of the HGLA. Geophysical data indicates that partially molten magma remains 2.5 to 3.8 miles (Wilson 2003; Bhattacharyya and Lees 2002) beneath these features.

The Coso Peak is identified by the U.S. Geological Survey (USGS) as a potentially active volcanic area based on the presence of the hydrothermal system and seismic activity (http://vulcan.wr.usgs.gov/Volcanoes/California/Coso/framework.html). The USGS considers the area subject to volcanic hazards from potential future production (Miller 1989).

3.5 SOILS

3.5.1 Applicable Regulations, Plans, Policies / Management Goals

The CDCA Plan's goals potentially applicable to soils are similar to those stated for geology and minerals resources, above. They 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, G-E-M database, and professional, technical, and managerial staff knowledgeable in mineral exploration and development.

The Code of Federal Regulations further specifies that, at a minimum, soils must be managed to maintain vegetative cover, soil moisture, and permeability rates appropriate for the soils, climate, and land forms found at their location. (43 CFR 4180.2(e) and (f))

3.5.2 Affected Environment

Soils data are not available for the entire HGLA. The Soils Technical Report previously prepared for the Coso Geothermal Study Area (Rockwell 1980), provides soils data for 63 percent of the HGLA. The area surveyed for the Coso Soils Technical Report does not include the northern portion of the HGLA in the vicinity of the Haiwee Reservoir. However, it is reasonable to assume that the soils in the area to the north (not included in the Coso Report) are generally similar to the soils included in the Coso Report because of similarities between geologic units and landforms in the two directly adjacent areas.

3.5.2.1 Haiwee Reservoir Soils

A general description of the soils surrounding the Haiwee Reservoir is provided in the "Draft Progress Report: "Total Maximum Daily Load for Copper for the Haiwee Reservoir" prepared by the California Regional Water Quality Board (2001). The soils on the western slope of the Haiwee Reservoir are derived from metasedimentary, metavolcanic and pyroclastic rocks, and alluvium from granitic rocks of the Sierra Nevada. The slopes range from two to 15 percent, with some slopes as steep as 75 percent closer to the Sierra range front. The soils are generally described as sandy loam, gravelly and or loamy sand, and cobbly sandy clay loam. Portions of the soils are classified as being very shallow to shallow in depth (5 to 20 inches), while the majority of the soil surrounding the western portion of the reservoir is classified as very deep (60 inches or greater). These very deep soils occur in the two to 15 percent slope areas, and are considered well drained with moderately slow permeability and runoff with a slight hazard of erosion by water. The shallow soils occur in the steeper slopes and are classified as excessively drained with rapid runoff potential and therefore severe hazard of erosion by water.

Soils form alluvial fan terraces on the eastern side of the Haiwee Reservoir. The slopes range from two to nine percent with 20 to 35 percent vegetative cover. The soils are classified as moderately deep to very deep, well drained soils that have slow to medium surface runoff potential and a slight hazard of erosion by water. Loamy sand, sand, and gravelly/cobbly loamy coarse sand are the general soil textural classifications that occur on the eastern flank of the reservoir. Localized portions of the soils on the eastern side are loamy coarse sands that occur on steeper slopes with rapid to very rapid surface runoff potential (Natural Resources Conservation Service [NRCS] 2001).

The types of soils found in the southern portion of the Haiwee Reservoir area include the following units:

- Cajon: Somewhat excessively drained soils formed in alluvium derived from granite. They are subject to water and wind erosion. The depth to a root restrictive layer is greater than 60 inches.
- Helendale-Cajon Complex: Well drained to somewhat excessively drained, formed in alluvium derived from granite. They are subject to water and wind erosion. The depth to a root restrictive layer is greater than 60 inches.
- Lithic Torriorthents-Bandland Complex: Somewhat excessively drained soils formed in residuum weathered from metavolcanics and/or metasedimentary rock and/or granite. They are subject to water and wind erosion. The depth to a root restrictive layer is three to 20 inches.
- Neuralia-Timosea-Typic Argidurids Complex: Well drained soils formed in alluvium derived from granite. They are subject to water and wind erosion. The depth to a root restrictive layer is 20 to greater than 60 inches.

The soils of the Haiwee reservoir area, and their limiting characteristics, are described in Table 3.5-1.

Table 3.5-1 Limiting Characteristics of Haiwee Reservoir Soil Map Units

Soil Map Unit	Unstable –			
	Cave-in Potential	Shrink-Swell Potential	Slope ≥ 15%	Expansive
Cajon loamy sand, stratified substratum, 0 to five percent slopes.	X	-	-	-
Helendale-Cajon complex, 0 to five percent slopes.	X	-	-	-
Lithic Torriorthents-Badland complex, 15 to 75 percent slopes.	X	-	X	-
Neuralia-Timosea-Typic Argidurids complex, two to 15 percent slopes.	X	X	X	X

(USDA 2010)

3.5.2.2 Coso Area Soils

Soils in the Coso area are generally coarse and rocky. They are derived from either the bedrock substrate or basement rocks in the Coso Range that consist of granitic rocks of Mesozoic age with older metasedimentary and metavolcanic rocks. The Sugarloaf Mountain area exhibits overlapping volcanic domes and flows with extensive obsidian outcrops. The types of soils found in the Coso area include the following (BLM 1980; MHA 2008):

- Dunmovin: Somewhat excessively drained, deep, sandy soils formed in alluvium. They are subject to water and wind erosion.
- Dunmovin-Lavic-Wasco Variant: Sandy and loamy soils, excessively to well drained, very deep, and formed in alluvium. They have a high potential for wind erosion and are susceptible to water erosion.
- Alko Variant-Joshua Variant-Nebona Variant: Shallow to deep, generally sandy and loamy with some clay lenses and silica-cemented hardpans. These soils are well drained and susceptible to wind and water erosion.
- Maynard Lake-Stumble: Sandy soils formed in alluvial plains from rhyolite tuff and volcanic ash deposits. These soils are highly porous and drain rapidly. They are subject to moderate water erosion and high wind erosion.
- Coso-Rock Outcrop: Shallow to very shallow units formed in granite outcrops. These soils are stony and loamy, and are excessively drained due to rapid runoff. They are highly susceptible to water and wind erosion.

The Coso area soils, and their general characteristics resented in Table 3.5-2.

Table 3.5-2 Limiting Characteristics of Coso Soil Map Units

Soil Map Unit	Unstable – Cave-in Potential	Shrink-Swell Potential	Slope ≥ 15%	Expansive
Arizo very bouldery loamy sand, 2 to 5 percent slopes.	-	-	-	-
Coso – Rock outcrop – Haiwee complex, 30 to 50 percent slopes.	-	-	X	-
Coso – Rock outcrop – Coso Variant association, steep.	-	-	X	-

Soil Map Unit	Unstable – Cave-in Potential	Shrink-Swell Potential	Slope ≥ 15%	Expansive
Dunmovin loamy coarse sand, 0 to 5 percent slopes.	X	-	-	-
Dunmovin loamy, coarse sand, 5 to 9 percent slopes.	X	-	-	-
Dunmovin bouldery loamy coarse sand, 5 to 9 percent slopes.	X	-	-	-
Dunmovin – Lavic complex, 0 to 2 percent slopes.	X	X	-	-
Dunmovin Variant – Nebona Variant – Alko Variant complex, 2 to 9 percent slopes.	-	X	-	X*
Hooten Variant bouldery loamy fine sand, 5 to 15 percent slopes.	-	-	-	-
Hooten Variant loamy fine sand, 5 to 9 percent slopes.	-	-	-	-
Joshua Variant – Arizo – Lavic complex, 2 to 5 percent slopes.	-	X	-	-
Lavic – Dunmovin – Playa association, nearly level.	X	X	-	-
Maynard Lake loamy coarse sand, 15 to 30 percent slopes.	X	-	X	-
Maynard Lake loamy coarse sand, 2 to 15 percent slopes.	X	-	X	-
Nebona Variant – Alko Variant cobbly loamy sands, 5 to 30 percent slopes.	-	X	X	X*
Rock outcrop – Haiwee Variant complex, 30 to 50 percent slopes.	-	-	X	X*
Rubble land – Torriorthents – Rock outcrop complex, 30 to 75 percent slopes.	-	-	X	-
Shoken-Rock outcrop association, steep Shoken stony sandy loam, 30 to 50 percent slopes.	-	-	X	-
Stumble loamy coarse sand, 15 to 30 percent slopes.	X	-	X	-
Stumble loamy coarse sand, 2 to 15 percent slopes.	X	-	X	-
Stumble loamy coarse sand, 30 to 50 percent slopes.	X	-	X	-
Wasco Variant very fine sandy loam, 0 to 2 percent slopes.	-	-	-	-

*Soil map units meet the first two criteria required to be considered expansive; insufficient data available to determine whether third criteria is met.
(Rockwell International 1980)

Soil erodibility is taken into consideration during the planning and designing stages for future projects. The erodibility of the soils within the Coso area ranges from slight to high (see Tables 3.5-3 and 3.5-4). A rating of "slight" indicates that the surface layer texture is typically clay that holds together, is thicker than 40 inches, and occurs on slopes of less than 15 percent. A moderate rating indicates that 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 high 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 (SDG&E 2006).

Table 3.5-3 Haiwee Reservoir Soil Types and Characteristics

Soil Map Unit	Hydrologic Soil Group*	Kf (Water Erosion Factor)**	Wind Erodibility Group***
Cajon loamy sand, stratified substratum, 0 to 5 percent slopes.	Cajon: A	Cajon: .17	Cajon: 2
Helendale-Cajon complex, 0 to 5 percent slopes.	Helendale: B Cajon: A	Helendale: .20 Cajon: .17	Helendale: 2 Cajon: 2
Lithic Torriorthents-Badland complex, 15 to 75 percent slopes.	Lithic Torriorthents: C Badland: D	Lithic Torriorthents: .20 Badland: -	Lithic Torriorthents: 3 Badland: 8
Neuralia-Timosea-Typic Argidurids complex, 2 to 15 percent slopes.	Nerualia: B Timosea: B Typic Argidurids: C	Neuralia: .20 Timosea: .20 Typic Argidurids: .24	Neuralia: 3 Timosea: 3 Typic Argidurids: 4

Source: NRCS 2010.

*Hydrologic soil groups are based on estimates of runoff potential. Group A has low runoff potential, and Group D has high runoff potential.

**Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

***The soils assigned to wind erodibility Group 1 are the most susceptible to wind erosion, and those assigned to Group 8 are the least susceptible.

Table 3.5-4 Coso Soil Types and Characteristics

Soil Map Unit	Inclusions	Runoff	Hazard of Water Erosion	Hazard of Soil Blowing
Arizo very bouldery loamy sand, 2 to 5 percent slopes.	• Dunmovin bouldery loamy coarse sand • Other soils	Slow	Slight	
Coso – Rock outcrop – Haiwee complex, 30 to 50 percent slopes. • Coso sandy loam, 30 to 50 percent slopes. Rock outcrop (granitic). • Haiwee very stony sandy loam, 30 to 50 percent slopes.	• Coso Variant • Typic Haplargids, fine, mixed, thermic • Typic Camborthids, loamy-skeletal, mixed, thermic	Medium to Rapid	High	
Coso – Rock outcrop – Coso Variant association, steep. • Coso stony sandy loam, 15 to 50 percent slopes. • Rock outcrop.	• Haiwee very stony sandy loam • Typic Haplargids, fine, mixed, thermic • Typic Camborthids, loamy-	Medium to Rapid	Moderate to High	

Soil Map Unit	Inclusions	Runoff	Hazard of Water Erosion	Hazard of Soil Blowing
• Coso Variant very stony sandy loam, 15 to 30 percent slopes.	skeletal, mixed, thermic			
Dunmovin loamy coarse sand, 0 to 5 percent slopes.	• Typic Torriorthents, coarse-loamy, mixed, thermic • Lavic loamy sand	Very Slow to Slow		High
Dunmovin loamy, coarse sand, 5 to 9 percent slopes.	• Dunmovin bouldery loamy course sand • Arizo gravelly loamy sand • Dunmovin Variant loamy sand	Slow to Medium	Slight to Moderate	High
Dunmovin bouldery loamy coarse sand, 5 to 9 percent slopes.	• Dunmovin gravelly loamy sand • Arizo gravelly loamy sand	Slow to Medium	Slight to Moderate	High
Dunmovin – Lavic complex, 0 to 2 percent slopes. • Dunmovin loamy coarse sand, 0 to 2 percent slopes. • Lavic loamy sand, 0 to 2 percent slopes.	• Riverwash • Typic Torriorthents, coarse-loamy mixed thermic	Very Slow	Slight	High
Dunmovin Variant – Nebona Variant – Alko Variant complex, 2 to 9 percent slopes. • Dunmovin Variant loamy sand, 2 to 9 percent slopes. • Nebona Variant cobbly loamy sand, 2 to 9 percent slopes. • Alko Variant cobbly loamy sand, 2 to 9 percent slopes.	• Joshua Variant sandy loam • Dunmovin loamy coarse sand	Slow to Medium	Slight to Moderate	High
Hooten Variant bouldery loamy fine sand, 5 to 15 percent slopes.	• Dunmovin bouldery loamy coarse sand • Hooten Variant loamy fine sand	Slow to Medium	Slight to Moderate	High
Hooten Variant loamy fine sand, 5 to 9 percent slopes.	• Dunmovin loamy coarse sand • Hooten Variant bouldery loamy fine sand	Slow to Medium	Slight to Moderate	High
Joshua Variant – Arizo – Lavic	• Nebona Variant	Very	Slight	Moderate

Soil Map Unit	Inclusions	Runoff	Hazard of Water Erosion	Hazard of Soil Blowing
complex, 2 to 5 percent slopes. • Joshua Variant sandy loam, 2 to 5 percent slopes. • Arizo very bouldery loamy sand, 2 to 5 percent slopes. • Lavic loamy sand, 2 to 5 percent slopes.	• Alko Variant	Slow to Slow		to High
Lavic – Dunmovin – Playa association, nearly level. • Lavic loamy sand, 0 to 2 percent slopes. • Dunmovin loamy coarse sand, 0 to 2 percent slopes. • Playa	• Typic Camborthids, loamy-skeletal, mixed, thermic • Typic Torriorthents, fine-silty, mixed, thermic	Very Slow	Slight	High
Maynard Lake loamy coarse sand, 15 to 30 percent slopes.	• Maynard Lake loamy coarse sand (over-welded tuff at 40 to 60 inches depth) • Coso stony sandy loam	Medium	Moderate	High
Maynard Lake loamy coarse sand, 2 to 15 percent slopes.	• Dunmovin loamy coarse sand	Slow to Medium	Slight to Moderate	High
Nebona Variant – Alko Variant cobbly loamy sands, 5 to 30 percent slopes. • Nebona Variant cobbly loamy sand, 5 to 30 percent slopes. • Alko Variant cobbly loamy sand, 5 to 30 percent slopes.	• Dunmovin cobbly loamy sand, 2 to 9 percent slopes • Joshua Variant • Torriorthents cobbly loamy sands • Hardpans at less than 8 inches depth	Medium to Rapid	Moderate to High	
Rock outcrop – Haiwee Variant complex, 30 to 50 percent slopes. • Rock outcrop. • Haiwee Variant very stony loam, 30 to 50 percent slopes.	• Typic Torriorthents, loamy-skeletal, mixed, mesic • Stumble loamy coarse sand (over andesitic tuff at 20 to 60 inches depth)	Medium to Rapid	High	
Rubble land – Torriorthents – Rock outcrop complex, 30 to 75 percent slopes. • Rubble land • Torriorthents • Rock outcrop	• Maynard Lake loamy coarse sand (over welded tuff at 20 to 60 inches depth)	Medium to Rapid	Moderate to High	

Soil Map Unit	Inclusions	Runoff	Hazard of Water Erosion	Hazard of Soil Blowing
Shoken-Rock outcrop association, steep Shoken stony sandy loam, 30 to 50 percent slopes. • Rock outcrop	• Lithic Torriorthents, loamy-skeletal, mixed, mesic • Typic Haplargids, fine, mixed, mesic • Typic Camborthids, loamy-skeletal, mixed, mesic	Medium to Rapid	Moderate to High	Moderate
Stumble loamy coarse sand, 15 to 30 percent slopes.	• Stumble loamy coarse sand (over-welded tuff at 40 to 60 inches depth) • Shoken stony sandy loam	Medium	Moderate	High
Stumble loamy coarse sand, 2 to 15 percent slopes.	• Haybourne loamy sand, 2 to 15 percent slopes • Playa	Slow to Medium	Slight to Moderate	High
Stumble loamy coarse sand, 30 to 50 percent slopes.	• Stumble loamy coarse sand (over-welded tuff at 20 to 60 inches depth) • Shoken stony sandy loam	Medium to Rapid	High	High
Wasco Variant very fine sandy loam, 0 to 2 percent slopes.	• Dunmovin loamy coarse sand • Lavic loamy sand	Very Slow	Slight	Moderate

Source: Rockwell 1980

3.6 WATER RESOURCES

3.6.1 Applicable Regulations, Plans, Policies/Management Goals

A number of state, federal, and regional regulations, policies, and plans are potentially applicable to surface and groundwater development at the HGLA and in Rose Valley. The CDCA multiple use class guidelines state that BLM land will be managed to provide for the protection and enhancement of surface and groundwater resources, except for instances of short-term degradation caused by water development projects, and states that best management practices will be used to avoid degradation and to comply with Executive Order 12088 (Oct. 13, 1978). Also at the federal level, Executive Order 12088 requires compliance with the federal Clean Water Act (CWA) which regulates the discharge of pollutants to waters of the United States from any point source. Section 402(p) amended the CWA and established a framework for regulating non-point source storm water discharges under the National Pollutant Discharge Elimination System (NPDES) program. In California, the

NPDES Stormwater Program is administered by the California Regional Water Quality Control Boards.

At the state level the HGLA lies within the jurisdiction of the Lahontan office of the Regional Water Quality Control Board (LRWQCB) which administers the Water Quality Control Plan (Basin Plan) for protection of beneficial uses of surface and groundwater of this part of the state. The Basin Plan sets forth water quality standards for the surface and ground waters of the Region, which include both designated beneficial uses of water and the narrative and numerical objectives which must be maintained or attained to protect those uses. It identifies required or recommended control measures for water quality problems. In some cases, it prohibits certain types of discharges in particular areas. The Plan summarizes applicable provisions of separate State Board and Regional Board planning and policy documents (e.g., the Regional Board waiver policy), and of water quality management plans adopted by other federal, state, and regional agencies.

At the local level the Inyo County General Plan (Inyo County 2001), Conservation and Open Space Element, identifies goals and policies relevant to hydrology and water quality. Relevant goals and policies from the Inyo County General Plan include:

- WR-1--Provide an adequate and high quality water supply to all users within the County. Its corresponding regulatory Compliance Policy WR-1.4 states: Continue the review of development proposals and existing uses to the requirements of the Clean Water Act, LRWQCB, and local ordinances to reduce polluted runoff from entering surface waters.

- WR-2--Protect and preserve water resources for the maintenance, enhancement, and restoration of environmental resources. PolicyWR-2.1requires Restoration: Encourage and support the restoration of degraded surface water and groundwater resources.

- WR-3--Protect and restore environmental resources from the effects of export and withdrawal of water resources. Corresponding policy WR-3.2 addresses Sustainable Groundwater Withdrawal: The County shall manage the groundwater resources within the County through ordinances, project approvals and agreements, ensure adequate, safe and economically viable groundwater supply for existing and future development within the County, protect existing groundwater users, maintain and enhance the natural environment, protect the overall economy of the County, and protect groundwater and surface water quality and quantity.

In addition, the BLM has designated the HGLA as Multiple-Use Class L: Limited Use. Multiple-use class guidelines are provided for each class in the CDCA Plan, and govern the type and degree of land-use actions allowed within the HGLA. Water quality guidelines for Class L areas state that "areas designated in this class will be managed to provide for the protection and enhancement of surface and groundwater resources, except for instances of short-term degradation caused by water development projects. As such, best management practices, developed by the BLM during the planning process outlined in the Clean Water Act, Section 208, et seq., will be used to avoid degradation and to comply with Executive Order 12088."

Most wetland and riparian areas also represent jurisdictional surface waters. The corresponding guidelines for Class L areas state that "Wetland/riparian areas will be considered in all proposed land-use actions. Steps will be taken to provide that these unique characteristics and ecological requirements are managed in accordance with Executive Order 11990, Protection of Wetlands (42 CFR 26951), legislative and Secretarial direction, and BLM Manual 6740:'Wetland Riparian Area Protection and Management'" (BLM 1979).

The Vegetation Plan Element of the CDCA Plan also addresses wetlands such as seeps and springs, riparian zones, and mesquite thickets, among others. Wetland-riparian areas are to be considered in all proposed land use actions where appropriate and legally possible. Steps are to be taken to ensure their unique characteristics and ecological requirements are managed in accordance with legislative, Executive, and Secretarial directions. To the extent possible all actions are to avoid adverse impacts to wetland and riparian areas.

The CDCA Water Resources Program requires the analysis of water resources impacts of various activities, including the collection of sufficient data to conduct adequate analysis and the formulation of recommendations for avoiding or mitigating impacts.

3.6.2 Affected Environment

3.6.2.1 Surface Water Resources

The HGLA is located within the Indian Wells-Searles Valleys Watershed (HUC 18090205) in the Rose Valley basin on the east side of the Sierra Nevada. The area in the vicinity of the HGLA is further divided into five sub-watersheds: Haiwee Creek, Fine Canyon-Rose Valley, South Haiwee Reservoir, Cactus Flats, and Portuguese Canyon. The majority of the HGLA area falls within the Haiwee Creek sub-watershed. Generally water flow is from north to south within the paleo Owens River valley, with runoff contributing from the Sierra Nevada Mountains to the west and the Coso Range to the east.

The climate of the Rose Valley is greatly influenced by the Sierra Nevada Range. These mountains cause a rain shadow effect east of the Sierra crest, where precipitation on the valley floor is appreciably less than that west of the crest. Therefore, the climate in Rose

Valley is semi-arid to arid, and is characterized by low precipitation, abundant sunshine, frequent winds, and moderate to low humidity. According to data collected from 1923 to 2009 at the Haiwee Reservoir by the Western Regional Climate Center (WRCC), the average annual maximum temperature is 73°F, and the average annual minimum temperature is 46°F. Average total annual precipitation is 6.55 inches and average total annual snowfall is five inches (WRCC 2010).

Rose Valley and the HGLA receive runoff from the surrounding mountains, which flows underground into the valley and then south to Little Lake. In addition, several perennial spring-fed streams flow from the Sierra Nevada including Portuguese Canyon, Lewis Canyon, Tunawee Canyon, Talus Canyon, Johnson Canyon and Haiwee Creek. However, much of Haiwee Creek is diverted to the Los Angeles Aqueduct via water intakes. Intermittent streams also flow from the Coso Range located to the east. The alluvial fans from the Coso Range runoff converge and create the northern boundary of the Rose Valley basin. Rose Valley is topographically separated from the Owens Valley to the north and the Indian Wells Valley to the south. As a result, there are no perennial streams in Rose Valley except for the outfall channel from Little Lake at the south end of Rose Valley, intermittent streams in the highlands west of the valley, and the concrete-lined LADWP aqueduct along the west side of the valley.

South Haiwee Reservoir

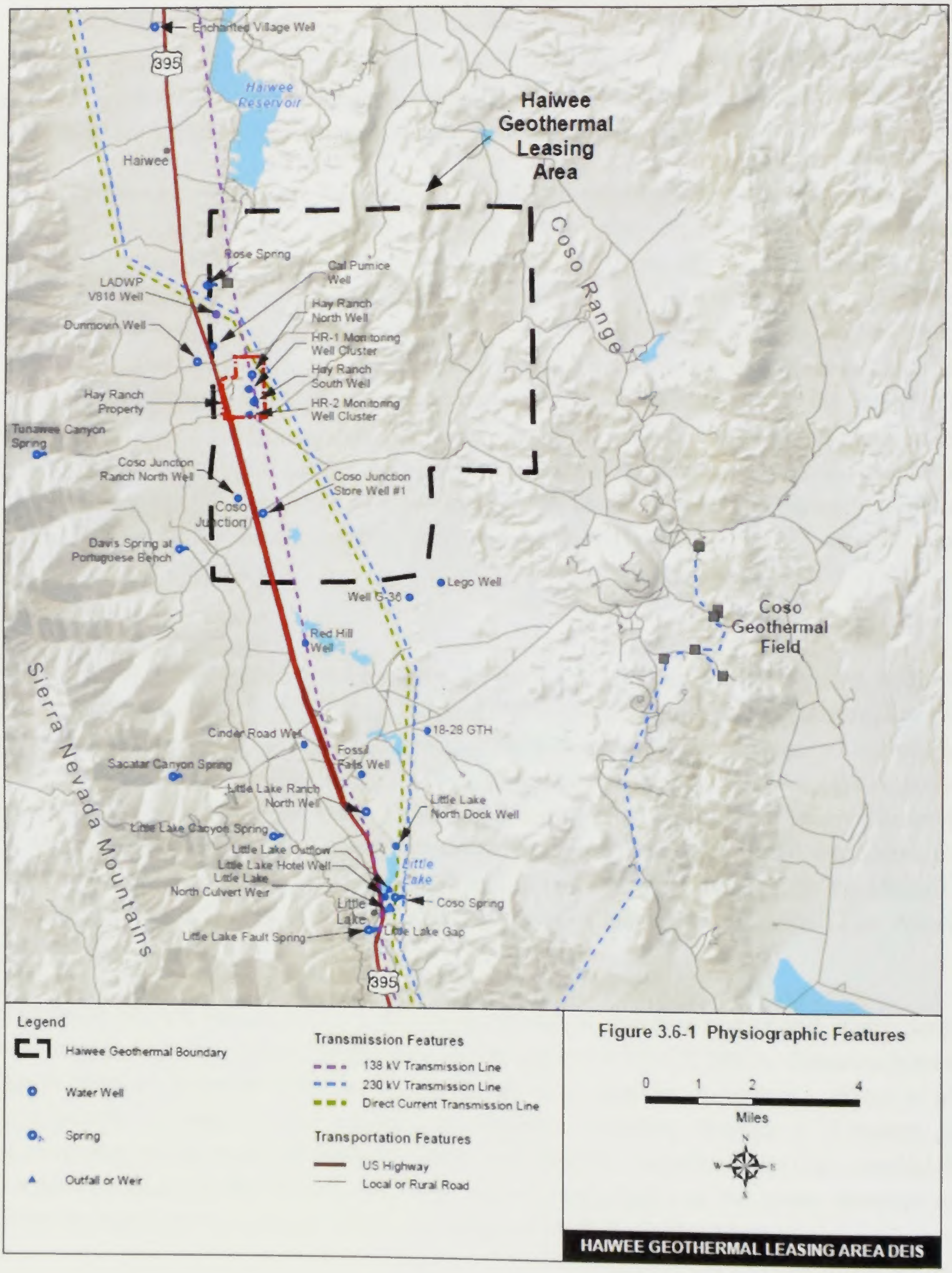
The South Haiwee Reservoir is located at the north end of Rose Valley near the northwest corner of the HGLA (Figure 3.6-1). The LADWP owns and operates the Haiwee Reservoir as part of the Los Angeles Aqueduct system, which supplies drinking water to Los Angeles. The majority of water inflow to the Haiwee Reservoir is from the Los Angeles Aqueduct, which diverts water from the Mono Basin and Owens Valley. The South Haiwee Reservoir is separated from the North Haiwee Reservoir by an earthen berm called the Merrit Cut. Water from the North Reservoir flows south and can exit the reservoir through the Merrit Cut to the South Reservoir or through the Haiwee bypass channel to the second Los Angeles Aqueduct.

The South Haiwee Reservoir has a maximum storage of 46,600 acre-feet and, under normal operating conditions, a water surface area of 800 acres (LRWQCB 2001). Releases from the South Haiwee Reservoir flow south to the first Los Angeles Aqueduct. Water is also occasionally diverted to the second Los Angeles Aqueduct through a Y-branch just downstream of the South Reservoir. Both Los Angeles Aqueduct pipelines parallel the western boundary of the HGLA, and cross only a small portion of the latter. Seepage loss from the reservoir may provide additional inflow to the Rose Valley basin.

The crest of the South Haiwee Reservoir is located at 3,766 feet above mean sea level (amsl). Because of seismic stability concerns, the water level in the reservoir is currently limited to a maximum elevation of 3,742 feet amsl. The water level in the reservoir stood at 3,730 feet amsl in November/December 2009 (LADWP 2009).

In addition to the Haiwee reservoirs, groundwater recharge comes chiefly from the percolation of runoff and infiltration of precipitation that falls to the valley floor. Alluvial fan deposits at the base of the Sierra Nevada serve as the principal areas for the percolation of runoff (CDWR 2004).

Figure 3.6-1 Physiographic Features of the Rose Valley



Springs

All springs described below are shown on Figure 3.6-1.

Rose Spring – Rose Spring is located in the HGLA two miles south and west of the South Haiwee Reservoir at an elevation of 3,640 feet amsl. The spring discharge data presented in Rockwell (1980) indicates that the spring was flowing in November 1975, but did not list discharge rate data for the spring. While the Rose Spring was reportedly sampled by the USGS in the early 1970's, no discharge has been observed from the spring in recent years. During a biological reconnaissance survey conducted on April 5, 2008, no surface water was observed at this spring. A concrete storage structure lies below the spring; however, water pipes that once fed the structure are no longer functioning (MHA 2008). When flowing, the spring apparently drains shallow groundwater in alluvial sediments south of the South Haiwee Reservoir and may receive some flow from the west. Due to its higher elevation and lack of current discharge, the Rose Spring is not believed to be directly connected to the Rose Valley groundwater aquifer system except as an ephemeral manifestation of inflow.

Tunawee Canyon Spring – Tunawee Canyon Spring is located in Tunawee Canyon four miles northwest of the town of Coso Junction at 5,200 feet amsl. Several springs are identified in the upper reaches of Tunawee Canyon on the USGS topographic map of the area. Tunawee Canyon Spring is likely sustained by high elevation precipitation infiltration in the Sierra Nevada Mountains to the west. Rockwell (1980) reported discharge rates of 1.6 to 15 gallons per minute (2.6 to 24 acre-feet/yr) from the spring in November 1975.

Davis Spring – The Davis Spring is located on the Davis Ranch, two miles west of Coso Junction. The Davis Spring is located on the west central side of Rose Valley at Portuguese Bench at an elevation of 3,870 feet amsl. The estimated groundwater discharge rate from the Davis Spring was reported to be seven acre-feet per year (ac-ft/yr) on an annualized basis in November/December 2007 (MHA 2008), and 9 ac-ft/yr in October/November 2009 (Inyo Co. 2009).

The Davis Spring discharge point is located more than 600 feet higher than the groundwater table in the Rose Valley aquifer east of the Davis property at Coso Junction. Spring flow is sustained by high elevation precipitation infiltration in the Sierra Nevada Mountains west of the Davis property. Discharge from the spring not used on the Davis property infiltrates back into the ground, after which it percolates downward to recharge the alluvial aquifer.

Sacatar and Little Lake Canyon Springs – Rockwell (1980) presents data from sampling springs in Sacatar Canyon and Little Lake Canyon in February 1979. The springs were reportedly located at elevations of 4,950 and 3,650 feet amsl, respectively. Sacatar Spring reportedly flowed at a rate of one to five gallons per minute (1.6 to 8 acre-feet/yr) in

November 1975. No flow rate data were identified for Little Lake Canyon Spring. Both springs are located in bedrock outcrops above and west of Rose Valley (Figure 3.6-1).

Little Lake Fault and Coso Springs – The Little Lake Fault Spring and Coso Spring are located at the south end of Rose Valley. Little Lake Fault Spring is located on the west side of US 395 one mile south of Little Lake. Coso Spring is located east of US 395, on the Little Lake Ranch property, about a quarter mile south of Little Lake. No data have been identified regarding the groundwater discharge rate from the Little Lake Fault Spring.

Coso Hot Springs are a key surface water resource in the vicinity of the HGLA. Although located more than 10 miles east-southeast from the HGLA, the Coso Hot Springs are included in this discussion as a result of their high cultural importance, and their listing on the National Register of Historic Places. The Coso Hot Springs are surface manifestations of the Coso geothermal reservoir, although the connection between the hot springs and the reservoir is complex.

Little Lake

Little Lake is an approximately 90-acre perennial lake located at the south end of Rose Valley, to the south of the HGLA, approximately seven miles south of the town of Coso Junction (Figure 3.6-1). The majority of Little Lake is located within the Little Lake Ranch, which is a 1,200-acre privately-owned recreational preserve owned and managed by Little Lake Ranch, Inc. Ten acres at the southeast corner of Little Lake is owned by the BLM, and includes a visitor overlook. The Little Lake area includes two smaller perennial ponds, a “siphon well”, several other ponds that reportedly contain water intermittently, and adjacent wetland habitat. Little Lake is reportedly three to five feet deep (MHA 2008); the depths of the other ponds are unknown. The depth and area of the lake have been enhanced by the construction of a low dike along its southern perimeter; consequently, the water level in the lake is regulated by the rate of groundwater inflow into the lake and the setting of a discharge weir located at the south end of the lake.

Little Lake and the surrounding wetland areas and ponds are fed by Little Lake Canyon Creek and a combination of groundwater, submerged springs that discharge beneath the lake bottom, and a surface spring (Coso Spring). Situated at the south end of Rose Valley, groundwater flow through the Little Lake Gap is constrained by bedrock to the east and west, and by an apparent subsurface bedrock rise below. The ground surface in the area slopes gently to the south between the northern property line and Little Lake, then more steeply south of Little Lake. As a result of the combination of south-sloping ground surface and bedrock barriers to lateral or vertical groundwater flow, some portion of the groundwater flows through the Little Lake Gap and discharges to the surface in this area where it is detained in the lake and pond system before infiltrating back into the ground on the southern part of the property.

Water discharging from the Little Lake Outfall at the south end of Little Lake is conveyed to the upper Little Lake pond through an open channel. Groundwater discharging from the Coso Spring, located ¼ mile south of Little Lake, also flows into the upper Little Lake pond. A siphon well located south of Little Lake (below the elevation of Little Lake and Coso Spring) brings additional groundwater to the surface where it is piped to the lower Little Lake pond. The discharge from both ponds flows through an open channel to the south where it is used to fill additional ponds when flow is adequate. However, all of the groundwater that surfaces on the Little Lake Ranch property infiltrates back into the ground before leaving the property; therefore, no surface water discharges to Indian Wells Valley.

The siphon well consists of a short vertical well screen and a 12-inch-diameter discharge pipe. As long as the discharge pipe is full of water (is "primed"), the pipe suctions groundwater from the vertical well screen. Little Lake Ranch staff can raise or lower the weir to control the discharge rate when the lake level is high enough to sustain discharge. No provision acts to manipulate the discharge rate from Coso Spring or the siphon well; both flows in accord with prevailing groundwater conditions.

Because the Little Lake Ranch property receives little rainfall, the surface water features and riparian habitat on the property depend heavily on an uninterrupted supply of groundwater to maintain surface water flow rates and to sustain plant growth. As a requirement of the approval of the Hay Ranch groundwater diversion project, Inyo County is currently monitoring surface water discharge rates at three locations on the property (Little Lake Outlet, Coso Spring, and a surface water collection ditch called the North Culvert) as well as water levels in Little Lake, several wells on the property (Inyo Co. 2009), and additional wells throughout Rose Valley.

Surface Water Quality

The State Water Resources Control Board (SWRCB) and its nine Regional Boards were established by the Porter-Cologne Water Quality Act of 1969 (CA Water Code § 13140-13143) to implement the CWA in California under the delegation and oversight of the United States Environmental Protection Agency. The SWRCB and Regional Boards set water quality standards and control measures for surface and ground waters, and regulate storm water discharges from construction, industrial, and municipal activities; dredge and fill activities; the alteration of any federal water body under the Section 401 certification program; and several other activities with practices that could degrade water quality. The Regional Board for the HGLA is Region 6: Lahontan RWQCB.

The Water Quality Control Plan for the Lahontan Region sets standards for surface waters in the region of the HGLA (RWQCB 2005). These standards consist of designated beneficial uses for surface water, numeric and narrative objectives necessary to support beneficial uses, and the state's anti-degradation policy. Table 3.6-1 summarizes the beneficial water uses of surface waters in the affected action area.

Table 3.6-1 Beneficial Uses of Surface Waters in the HGLA

Surface Water	Beneficial Uses	Receiving Water
Minor Wetlands Along US 395	- Municipal & domestic supply - Agricultural supply - Groundwater recharge - Water recreation - Wildlife habitat - Preservation of biological habitats of special significance - Water quality enhancement - Flood peak attenuation/flood water storage	N/A
Haiwee Reservoir Wetlands	- Municipal & domestic supply - Agricultural supply - Groundwater recharge - Water recreation - Cold freshwater habitat - Wildlife habitat - Water quality enhancement - Flood peak attenuation/flood water storage	Haiwee Reservoir
Haiwee Reservoir	- Municipal & domestic supply - Agricultural supply - Industrial service supply - Groundwater recharge - Water recreation - Cold freshwater habitat - Wildlife habitat - Rare, threatened, or endangered species - Spawning, reproduction, & development of fish & wildlife	LA Aqueduct
Little Lake	- Groundwater recharge - Water recreation - Warm freshwater habitat - Wildlife habitat	Little Lake
Little Lake Canyon Creek	- Municipal & domestic supply - Agricultural supply - Groundwater recharge - Water recreation - Warm freshwater habitat - Wildlife habitat	Little Lake
Intermittent Tributary	- Municipal & domestic supply - Agricultural supply - Groundwater recharge - Water recreation	Little Lake

Surface Water	Beneficial Uses	Receiving Water
	- Warm freshwater habitat - Wildlife habitat - Water quality enhancement	
Minor Wetlands	- Municipal & domestic supply - Agricultural supply - Groundwater recharge - Water recreation - Warm freshwater habitat - Wildlife habitat - Water quality enhancement - Freshwater replenishment - Flood peak attenuation/Flood Water Storage	N/A

Source: Geologica 2010

Additional surface waters and their periodic beneficial uses include:

- Spring discharge from the Tunawee Canyon and Davis springs on the west side of Rose Valley is used for irrigation and domestic supply.
- Rose Spring is currently dry but apparently has been used in the past to water livestock.
- Use of discharge from Sacatar Canyon, Little Lake Canyon, and Little Lake Fault Springs was not identified but likely contributes to support of desert riparian plant stocks on the west side of US 395 near the Little Lake Ranch property.

Section 305(b) of the CWA mandates biennial assessments of the nation's water resources to identify and list waters with impaired water quality. The Lahontan RWQCB identified Haiwee Reservoir as being impaired due to elevated levels of copper. The Haiwee Reservoir is on the 2006 CWA 303(d) List of Water Quality Limited Segments (SWRCB 2009). Copper is related to LADWP's use of copper sulfate to control algae blooms that cause taste and odor problems in drinking water supplies. Section 303(d) requires the establishment of Total Maximum Daily Loads at a level necessary to implement applicable water quality standards. Total Maximum Daily Loads development for Haiwee Reservoir is in progress.

Wetlands

The National Wetlands Inventory identifies perennial and intermittent lakes, freshwater emergent, and freshwater forested/shrub wetlands on and in the vicinity of the HGLA (Table 3.6-2). The North Haiwee Reservoir and the South Haiwee Reservoir are two man-made permanently flooded lakes just north of the Rose Valley. They serve as storage for the Los Angeles Aqueduct system. At the south end, there is a shallow natural water feature called Little Lake. Flow south from Little Lake is controlled by a small earthen dam and a system of weirs with outflow into wetlands south of the lake. Freshwater emergent and scrub-shrub wetlands are located along the shorelines of these three lakes and associated with the outflow. The most notable wetland within the HGLA is a playa lake in the southwest corner. Playa lakes are shallow, unvegetated, intermittent lakes exceeding 20 acres in size that contain water during the wet season and dry up in the summer. They are located on flat areas at the lowest part of an undrained desert basin. This playa lake receives drainage from Portuguese Canyon to the west. Smaller pond-sized playas are located elsewhere nearby. If ordinary high water mark indicators are present, these playas may be identified as potential non-wetland Waters of the United States and subject to United States Army Corps of Engineers (USACE) jurisdiction (USACE 2008).

Table 3.6-2 Wetlands on and in the Vicinity of the HGLA

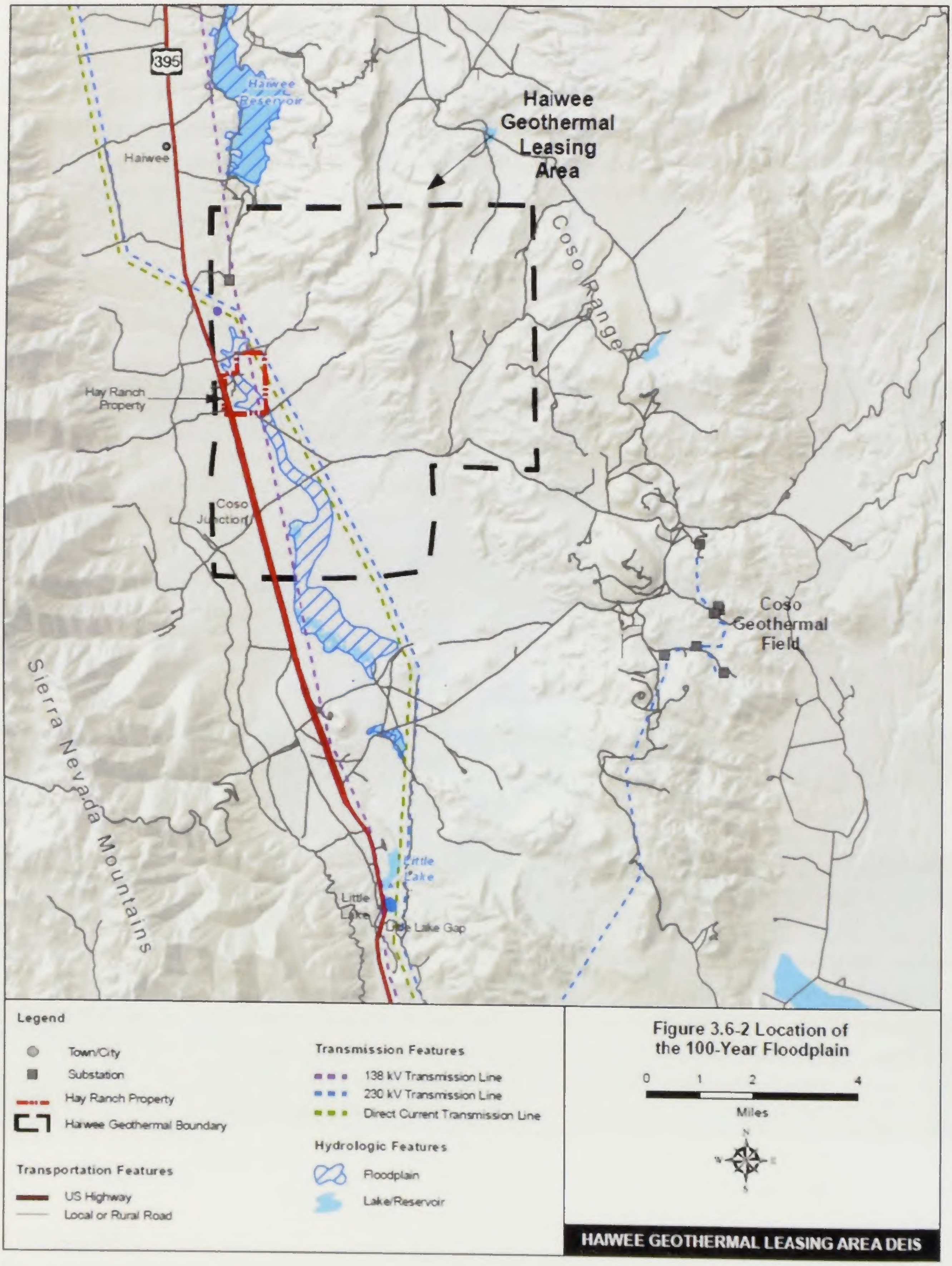
Wetland Classification	Definition	Type and Area of Occurrence
L1UBHh	Lacustrine, limnetic, unconsolidated bottom, permanently flooded, diked/impounded	Lakes (Haiwee Reservoir and Little Lake)
PEMCh	Palustrine, emergent, seasonally flooded, diked/impounded	Freshwater emergent wetland (associated with Haiwee Reservoir and Little Lake)
PEMB	Palustrine, emergent, saturated	Freshwater emergent wetland (south of South Haiwee Reservoir)
L2USJ	Lacustrine, littoral, unconsolidated shore, intermittently flooded	Playa lake
PUSJ	Palustrine, unconsolidated shore, intermittently flooded	Playas
PSSCh	Palustrine, scrub-shrub, seasonally flooded, diked/impounded	Freshwater forested/shrub wetland (associated with Little Lake)
PEMFh	Palustrine, emergent, semi-permanently flooded, diked/impounded	Freshwater emergent wetland (associated with Little Lake)
PUSCh/PSSAh	Palustrine, unconsolidated shore, seasonally flooded, diked/impounded/palustrine, scrub-shrub, temporarily flooded, diked/impounded	Freshwater forested/shrub wetland and other (associated with Little Lake)

Source: Geologica 2010

Floodplains

Floodplain data for the HGLA was obtained from the Federal Emergency Management Agency (FEMA) National Flood Insurance Program maps. A 100-year floodplain (Zone A) exists along the shores of the South Haiwee Reservoir, and in the low lying areas of Rose Valley where runoff from the surrounding mountains is captured (Figure 3.6-2). The valley floodplain crosses the southwest portion of the HGLA. It starts in the north end of the valley, three miles south of the South Haiwee Reservoir in T21S, R37E, Section 2, and extends south for seven miles to T22S, R38E, Sections 19 and 20, near the base of Red Hill. The floodplain contains the playa lakes described above. Zone A is considered a high flood risk area. Detailed analyses have not been performed for this zone; therefore, no depths or base flood elevations are shown.

Figure 3.6-2 Location of 100-year Floodplain



Groundwater

The principal hydrostratigraphic units that comprise the Rose Valley aquifer consist of recent alluvial deposits as well as the Coso Lake Bed and Coso Sand Members of the Coso Formation. No information was identified regarding the water-yielding properties of older bedrock underlying Rose Valley.

Groundwater Occurrence and Flow

Within Rose Valley, the groundwater table is typically first encountered during drilling within the upper portion of recent alluvial deposits. Figure 3.6-3 shows the lateral extent of alluvial deposits. Depth to groundwater ranges from 140 to 240 feet bgs in the north and central parts of Rose Valley. It raises to 40 feet bgs at the northern end of the Little Lake Ranch near the south end of the valley, and surfaces at the southern end of the Little Lake Ranch property.

Depth to groundwater and groundwater elevation in wells located throughout Rose Valley are being monitored for the Hay Ranch groundwater diversion project (Inyo Co. 2009). The estimated average groundwater elevation levels in Rose Valley, based on data obtained from monitoring wells in November 2009 from the groundwater elevation hydrographs published at the Inyo County Water Department's Hay Ranch Monitoring data portal (Inyo Co. 2009), are tabulated in Table 3.6-3. Figure 3.6-3 presents a groundwater elevation contour map of Rose Valley developed from these data. As depicted on Figure 3.6-3, the November 2009 groundwater elevation data indicated generally southeasterly groundwater flow along the axis of the northwest to southeast trending Rose Valley.

Long term groundwater level hydrographs posted at the Inyo County Water Department website (Inyo Co. 2009) indicate that groundwater levels have generally risen one to two feet in the central part of Rose Valley over the last six years. However, comparison of the estimated average November 2007 and November 2009 groundwater elevation values listed in Table 3.6-3 indicates that, with the exception of the LADWP Well 816 at the north end of Rose Valley, groundwater levels in most of the wells changed by less than one foot over the two-year period. Groundwater levels in the LADWP V816 well at the north end of Rose Valley vary up to five feet or more during the year. This area has lower transmissivity than the main part of Rose Valley (see discussion below), and is closer to the South Haiwee Reservoir; as a consequence, it may be influenced more by variable seepage losses from the reservoir.

Figure 3.6-3 Groundwater Elevation Contours (November 2009)

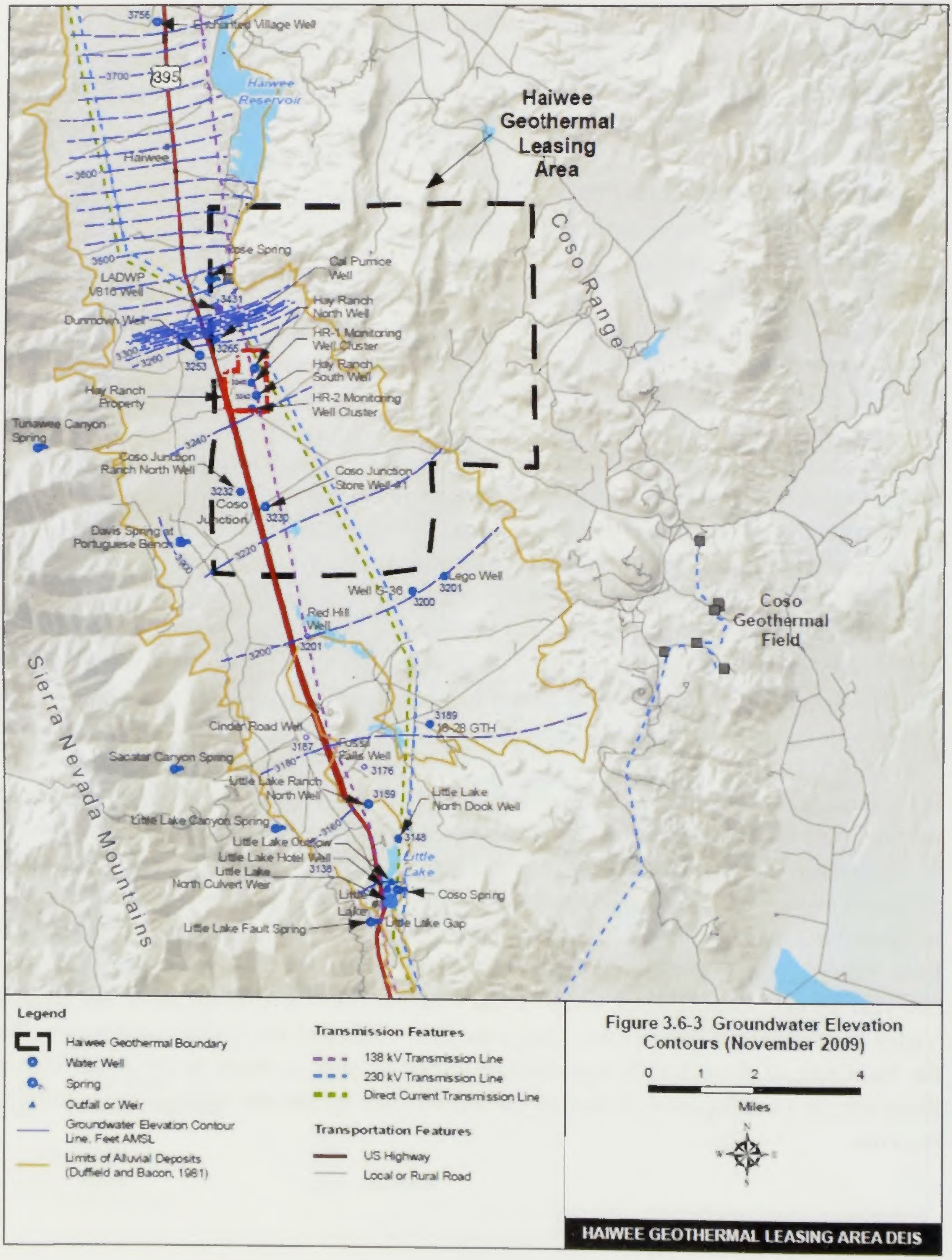


Table 3.6-3 Estimated Average November 2009 Groundwater Elevation

Well	Groundwater Elevation, feet amsl November 2007 (1)	November 2009 (2)
Enchanted Village	NM	3,755.5
LADWP 816	3,435.2	3,430.8
Dunmovin	NM	3,253.0
Cal Pumice	3,266.0	3,265.4
Hay Ranch North	3,245.0	3,245.3(3)
HR-1A	NM	3,244.3
HR-1B	NM	3,243.1
HR-1C	NM	3,245.6
HR-2A	NM	3,241.1
HR-2B	NM	3,238.5
HR-2C	NM	3,242.6
Hay Ranch South	3,240.9	3,241.8
Coso Junction Ranch	3,232.7	3,232.2
Coso Junction Store #1	3,229.3	3,229.8
Red Hill	NM	3,200.8
Lego	3,200.5	3,200.6
G-36	3,199.6	3,200.0
Cinder Road	NM	3,187.0
18-28 GTH	3,188.2	3,188.5
Fossil Falls	NM	3,175.6
Little Lake Ranch North	3,158.95	3,158.9
Little Lake Ranch Dock	NM	3,147.9
Little Lake Surface	NM	3,147.4
Little Lake Ranch Hotel	NM	3,138.3

Source: Geologica 2010.

Notes: (1) MHA (2008) Table 3.2-2

(2) Average November 2009 groundwater elevation estimated by Geologica from groundwater elevation hydrographs presented at the Inyo County Water Department's Hay Ranch Monitoring Website, http://www.inyowater.org/coso/default.html accessed December 4, 2009.

(3) Monitoring terminated in September 2009; groundwater level estimated from September 2009 monitoring results.

NM = not measured; amsl = above mean sea level

Aquifer Properties

Northern End of Rose Valley.

The LADWP conducted a 6.5 day pumping test in its wells in the northern end of Rose Valley in the spring of 2009. These LADWP wells are located approximately four miles north of Coso Junction. LADWP pumped Well V817 at a constant rate of 1.84 cubic feet per second (cfs) for 6.5 days. The pumping test resulted in 270 feet of drawdown in the pumping well, 48 feet of drawdown in a monitoring well (V816) located 197 feet west of the pumped well, and no drawdown in other nearby wells. LADWP concluded that this response indicated a small zone of influence and a deep cone of depression for pumping from this well. LADWP estimated an average transmissivity of 1,340 feet squared per day (ft^2/day), and a storage coefficient of 0.004 based on groundwater level response during the pumping test.

North Central Rose Valley/Hay Ranch Area.

The transmissivity of the upper portion of the alluvial deposits was previously estimated to range from 9,000 to 69,800 gpd/ft (1,200 to 9,330 ft^2/day) based on data in the Rockwell Report (1980). Based on 24-hour pumping tests conducted in the Hay Ranch wells, GeoTrans (2003) concluded that the transmissivity of the Rose Valley aquifer near Hay Ranch was approximately 10,000 ft^2/day, and estimated that the (horizontal) hydraulic conductivity was 20 ft/day. GeoTrans concluded that they had insufficient data to estimate aquifer storage properties.

Based on a 14-day pumping test conducted in the Hay Ranch South well, and monitoring wells throughout the valley, it was concluded that the best estimates of the transmissivity and horizontal hydraulic conductivity of the aquifer were 14,750 ft^2/day and 24 ft/day, respectively (MHA 2008, Appendix C1). The vertical hydraulic conductivity of the alluvial aquifer in central Rose Valley was estimated to be 0.01 ft/day (using a Neuman "Beta" coefficient of 0.01 from the aquifer testing type curve match and an aquifer thickness of 600 feet). The storage coefficient applicable to early time response and saturated soil below the water table was found to be 0.001.

South End of Rose Valley.

No aquifer testing data have been identified for the southern portion of Rose Valley. Rockwell (1980) estimated the transmissivity of the aquifer near the Little Lake Hotel well to be on the order of 8,500 ft^2/day based on an empirical approximation related to well specific capacity. Based on calibration of a numerical groundwater flow model for the Rose Valley aquifer, GEOLOGICA (in MHA 2008, Appendix C2) estimated that the transmissivity of the southern portion of the Rose Valley aquifer ranged from 5,300 to 32,000 ft^2/day.

Summary.

As a result, a review of the groundwater elevation contour map developed for Rose Valley reveals the presence of several areas of distinctly different groundwater gradient, potentially indicating variable recharge rates or transmissivity in different parts of Rose Valley. From the vicinity of the Cal Pumice well near the north end of Rose Valley to Little Lake at the south end of Rose Valley, a relatively low groundwater gradient of approximately 20 ft/mile was observed (see Figure 3.6-2). At the north end of Rose Valley, between South Haiwee Reservoir and the LADWP V816 well, a higher gradient of approximately 135 ft/mile was observed. However, between the LADWP V816 and Cal Pumice wells, the groundwater elevation drops 120 feet in less than 0.2 miles, indicating a very high groundwater gradient. Groundwater inflow from alluvial fan deposits northwest of South Haiwee Reservoir, and seepage losses from the reservoir, may contribute to the higher groundwater gradient near and immediately south of the reservoir. The pumping test conducted by LADWP in Well V817 indicated that the transmissivity of the aquifer in this area is likely significantly lower than it is in the main part of the valley. The very high groundwater gradient between Well V816 and Cal Pumice well is likely indicative of a very low permeability zone. USGS (2009) has concluded that a barrier to groundwater flow exists in this area. However, the consistent southerly groundwater gradient from the Enchanted Village well at the north end of the HGLA to LADWP's Well V816, Cal Pumice well, and remaining wells in southern Rose Valley indicates that continuity of groundwater flow exists.

Groundwater Quality

The chemistry of groundwater found in Rose Valley and the associated watershed varies widely, reflecting the multiple types of waters within a hydrological system typical of the semi-arid western United States. Water chemistry is influenced by the interaction between groundwater and rock along the hydrological flow paths and by the addition of a geothermal brine component. Recharge waters from drainage from the mountains surrounding Rose Valley have lower dissolved solids than the valley's groundwater, which typically is higher in dissolved solids reflecting longer transit times and a greater degree of water-rock interaction.

Total dissolved solids (TDS) range from very low to a few hundred milligrams per liter (mg/L) in surface streams draining the Sierras to the west of the HGLA or in springs of the Coso-Argus Range to the east, to several thousand mg/L in geothermal brines in the Coso Geothermal Reservoir and related geothermal surface manifestations to the east of the HGLA. Groundwater in the northern Rose Valley near Hay Ranch is characterized by TDS between 800 and 900 mg/L, whereas groundwater in the southern Rose Valley is characterized by TDS from 500 to 700 mg/L. At Little Lake, the water is slightly brackish with TDS from 1,500-2,500 mg/L. A more detailed discussion of the valley's ground water chemistry is presented in Appendix C.

Hay Ranch groundwater appears to be a more concentrated version of Haiwee Reservoir water. The dominance of sulfate in waters in the northern part of Rose Valley (Hay Ranch and Dunmovin) distinguishes these waters from the rest of the valley. Although the Hay Ranch wells were drilled deeper than many of the other wells in the valley, the Dunmovin well is not, so depth alone probably does not produce the difference in water chemistry. Similarly, concentration of these waters by evaporation alone would not produce the chemistry of the Little Lake waters, suggesting that other waters must mix with the northern Rose Valley waters as they flow southward towards Little Lake prior to evaporation in the Lake which produces the distinct chemistry of Little Lake water.

Because the shallow Little Lake waters are enriched in two stable isotopes (oxygen-18 and deuterium) and chloride, evaporation does likely contribute to lake chemistry. Both chloride and stable water isotopes become enriched when water is evaporated, but only chloride and one of the stable isotopes,oxygen-18, are enriched in geothermal waters. Coso Geothermal Field waters are also enriched in chloride relative to Rose Valley waters, by a factor of 10, but not in deuterium or as significantly in oxygen-18. This suggests that mixing of geothermal waters from the Coso geothermal field is unlikely to impact the Little Lake water significantly. However, comparison of chloride, deuterium, and oxygen-18 in Little Lake and Coso geothermal waters, does suggest that the Lego well, located on the southeast side of Rose Valley, may be a mixture of Sierra water and Coso geothermal water.

Current Groundwater Use

Groundwater in Rose Valley is used for domestic drinking water supply, limited irrigation, light industrial processes, and, at the south end of the valley, for maintenance of riparian habitat in the Little Lake area. Starting in late 2009, groundwater from the two Hay Ranch wells has also served as makeup water for the Coso Geothermal facilities. The Hay Ranch Groundwater Extraction and Delivery System project started pumping in late December 2009. Under the terms of Inyo County's Conditional Use Permit, the project proponent, Coso Operating Company, is allowed to extract groundwater from two wells on the Hay Ranch property near the north end of the valley, and conveys the water by surface pipeline across the HGLA to the Coso Geothermal field nine miles to the southeast. The amount of pumping that is initially permitted, 3,000 acre-feet per year, is a large fraction of the estimated 5,100 acre-feet per year annual recharge to the Rose Valley aquifer. As a result, this withdrawal represents the single largest use of groundwater in Rose Valley. Previously, the Draft EIR for the Hay Ranch Water Extraction and Delivery System Project (MHA 2008) estimated that 40 acre-ft/yr of groundwater production from wells are available in Rose Valley. Rockwell (1980) reported that irrigation pumping at the Rose Valley Ranch (now referred to as the Hay Ranch) started in 1975, and averaged 3,000 acre-ft/yr. In 1979, the Rose Valley Ranch reportedly pumped 3,130 acre-ft/yr of groundwater from the two wells on the property for alfalfa irrigation. Alfalfa farming ceased in the early 1980s. No significant agricultural irrigation, or groundwater extraction for any other purpose, had occurred in the valley since that time until development and startup of the Hay Ranch Water Groundwater Extraction and Delivery Project.

Drinking water quality (potability) of waters within the Rose Valley ranges from excellent to marginal. Available data (MHA-RMT 2009) indicate that Hay Ranch waters exceed primary drinking water standards (USEPA 2003) for arsenic, nitrate and nitrite. Secondary drinking water standards are primarily related to aesthetics and taste. Several waters exceed the secondary drinking water standard levels for TDS and sulfate. Recent analysis of water samples from the Hay Ranch wells indicates the water does not meet secondary drinking water standards for TDS, sulfate, iron and manganese (Table 3.6-4).

Table 3.6-4 Hay Ranch Wells - Drinking Water Quality Test Results

Hay Ranch North and South Well Groundwater Analytical Results for Drinking Water Quality								
Analyte	**Drinking Water Standard[1]**	**MCL[2] or Secondary Level[2] (mg/l)**	**South Well 09/10/03 Result[3] (mg/l)**	**South Well 09/11/03 Result[3] (mg/l)**	**South Well 12/03/07 Result[4] (mg/l)**	**North Well 09/13/03 Result[3] (mg/l)**	**North Well 09/14/03 Result[3] (mg/l)**	**Coso Junction Office Well[4] 01/30/03 Result[3] (mg/l)**
General Minerals								
Alkalinity, Total			330	320		260	250	
Bicarbonate (as $CaCO_3$)			330	320		260	250	326
Carbonate (as $CaCO_3$)			ND	ND		ND	ND	
Hydroxide (as $CaCO_3$)			ND	ND		ND	ND	
Chloride	Secondary	250	74.1	75.7	73	72	79	33.7
Conductivity (umho/cm)			1320	1300		1360	1370	
Cyanide	Primary (CA)	0.15			<0.1			
Fluoride	Primary	2.0	0.22	0.20	0.31	0.15	0.20	0.53
Hardness (Ca, Mg-$CaCO_3$)			465	455		430	430	
Nitrate	Primary	10	2.15	2.60	12	1.44	2.05	6.01
Nitrite	Primary	1			2.7			
Sulfate	Secondary	250	257	251	260	336	329	97.3
Total Dissolved Solids (TDS)	Secondary	500	850	844	850	910	945	634
Other								
pH (pH units)	Secondary	6.5-8.5	7.12	7.28	7.61	7.43	7.48	6.53
Color	Secondary	15 units			<3.0			
Odor	Secondary	3 ton			<1.0			
MBAS	Secondary	0.5			<0.05			
Asbestos	Primary	7 MFL			<0.02 MFL			
Metals								
Aluminum	Primary (CA)	1			0.054			
Antimony	Primary	0.006	ND	ND	<0.002	ND	ND	
Arsenic	Primary	0.010	ND	ND	0.016	ND	ND	0.0034

Hay Ranch North and South Well Groundwater Analytical Results for Drinking Water Quality

Analyte	Drinking Water Standard[1]	MCL[2] or Secondary Level[2] (mg/l)	South Well 09/10/03 Result[3] (mg/l)	South Well 09/11/03 Result[3] (mg/l)	South Well 12/03/07 Result[4] (mg/l)	North Well 09/13/03 Result[3] (mg/l)	North Well 09/14/03 Result[3] (mg/l)	Coso Junction Office Well[4] 01/30/03 Result[3] (mg/l)
Barium	Primary	2	0.058	0.042	<0.1			
Beryllium	Primary	0.004	ND	ND	<0.001	ND	ND	
Cadmium	Primary	0.005	ND	ND	<0.001	ND	ND	
Calcium			114	113		97.6	96.3	73.7
Chromium	Primary	0.1	ND	ND	<0.01	ND	ND	
Cobalt			ND	ND		ND	ND	
Copper	Primary	1.3	ND	ND	<0.05	ND	ND	
Fluoride	Primary	0.002						
Iron	Secondary	0.3	7.01	0.27	<0.01	1.35	0.114	
Lead	Primary	0.005	ND	ND	<0.002	ND	ND	
Magnesium			39.8	37.7				
Manganese	Secondary	0.05	0.449	0.047	<0.02	37.6	36.0	36.6
Mercury	Primary	0.002	ND	ND	<0.0002	ND	ND	
Molybdenum			ND	ND		ND	ND	
Nickel			ND	ND		ND	ND	
Potassium			11.8	11.8		8.67	9.38	6.91
Selenium	Primary	0.05	ND	ND	0.003	ND	ND	
Silver	Secondary	0.10	ND	ND	<0.01	ND	ND	
Sodium			111	111		136	133	50.3
Thallium	Primary	0.0005	ND	ND	<0.001	ND	ND	
Vanadium			ND	ND		ND	ND	
Zinc	Secondary	5	0.032	0.022	<0.05	0.033	0.036	

Source: Coso Operating Company 2008.

Notes: This table is compiled from Geotrans, 2004 with addition from Coso in 2007.

[1] Primary and secondary drinking water standards as defined by the US EPA, June 2003, unless noted with 'CA' for California Standards.

[2] MCL = Maximum Contaminant Levels are legally enforceable standards that apply to public water systems; Secondary Levels are suggested but not enforceable guidelines for drinking water.

[3] Results are bold for those that exceed the MCL of Secondary Level for the respective analyte.

[4] Coso Junction office well results received from Paul Spielman, Caithness Energy.

At the north end of Rose Valley, as many as 30 domestic wells are believed to extract relatively small quantities of groundwater for domestic uses and small scale irrigation in the Dunmovin area. The Coso Ranch South well, southern Coso Junction Store well (Coso Junction #2), and the Cal Trans well at Coso Junction are regularly used by businesses in the area. The Cal-Pumice mine reportedly takes five to 10 tanker trucks of water a day during the workweek from the Coso Ranch South well. The Coso Junction Store well supplies the general store and Coso Operating Company offices in Coso Junction. One of the wells near the north end of the Little Lake Ranch property reportedly provides water to a local cinder mine. The Siphon Well on the Little Lake Ranch property extracts groundwater in a gravity-fed system and delivers it to a pond a short distance to the south; some portion of that water likely evaporates, but the majority is believed to infiltrate back into the aquifer.

Anticipated Future Groundwater Use

A pending groundwater extraction project is proposed by the LADWP to capture groundwater seepage from the South Haiwee Reservoir using wells owned by LADWP located at the north end of Rose Valley. If approved, this project would reportedly entail extracting groundwater at a rate of 870ac-ft/yr for discharge into the adjacent LADWP aqueduct. LADWP is still in the planning stages for this project.

3.6.2.2 Geothermal System and Surface Manifestations

The relationship between the HGLA and the Coso Hydrothermal System is described below. The HGLA lies north and west of the Coso Hydrothermal System which is currently supplying geothermal fluids for power generation (see Figure 3.6-4). No geothermal exploration results for this area appear to be readily available in the public domain (BLM, 2009, personal communication). Therefore, the relationship between the areas must be evaluated using comparison of the general geologic setting.

The geologic setting which has produced the Coso geothermal system includes:

- Permeability: A zone of crustal extension in a releasing step over between two major faults that has generated brittle faulting within the field and produced the fracture permeability within the geothermal system. This faulting theoretically terminates at depth in the transition from brittle to ductile rock at four kilometers and to the west at Sugar Loaf Mountain (Unruh et al. 2001).

- Heat: A heat source at 2.5 miles, consisting of a partially liquid crystallizing rhyolite magma body, underlies the Coso geothermal system and probably produced the most recent igneous manifestation: the 40,000 year old rhyolite dome known as Sugarloaf Mountain. (Wicks, et al. 2001);

- Fluid: Evidence of meteoric water influx (Adams, et al. 2000).

Permeability

Surface rocks in the HGLA appear to be primarily valley sediments, but volcanics of the Coso Range and Mesozoic Sierra granitic rocks outcrop in the uplifted eastern side of the area (see Figure 3.6-1).

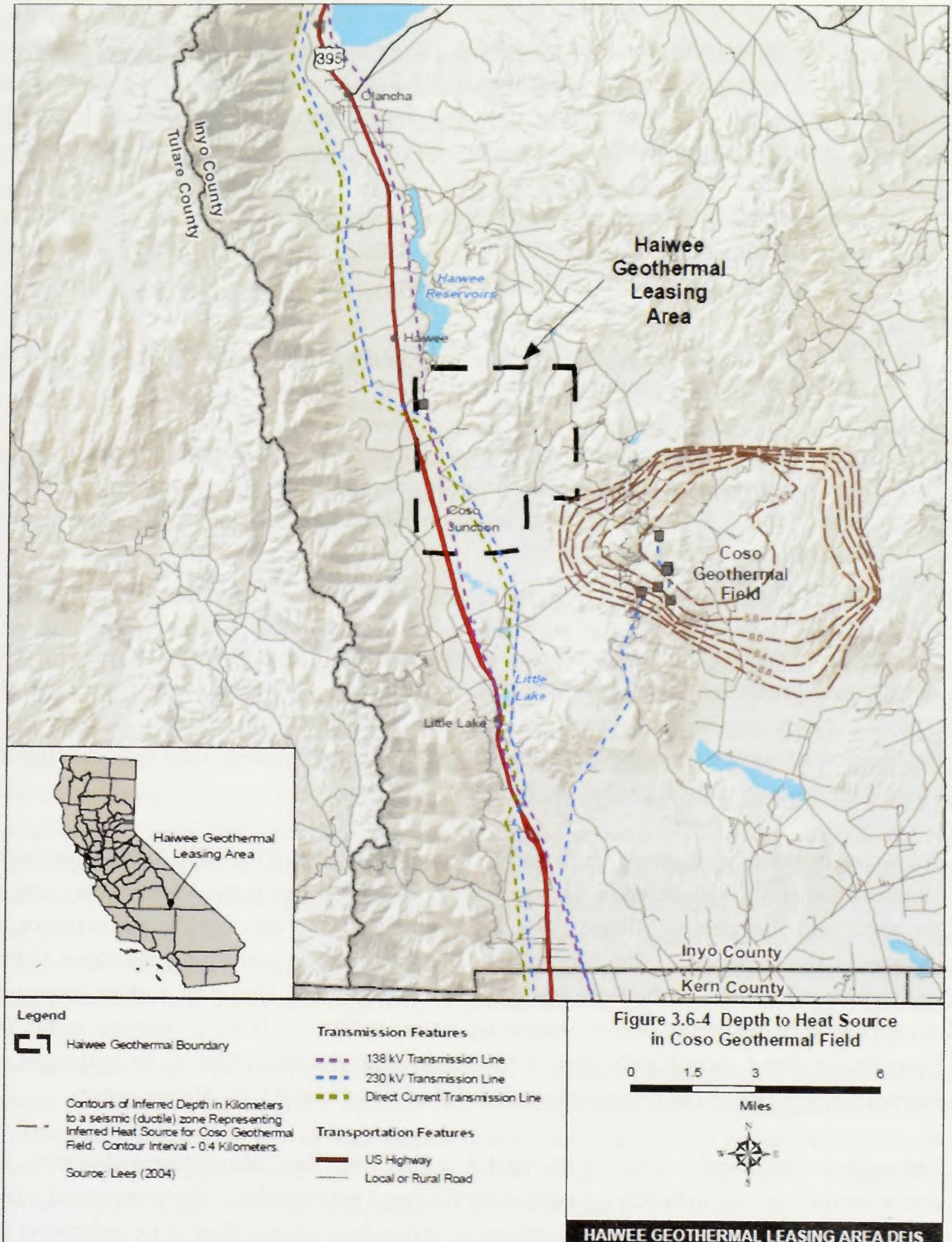
Mesozoic granitic rocks similar to those which form the reservoir rock for the Coso geothermal system appear to underlie the HGLA. The basement rocks of Rose Valley are thought to be Sierran granitic rocks. Although these rocks outcrop on the eastern side of the

HGLA, the basement rocks beneath the valley sediments may be between 4,000 and 9,000 feet below the surface (MHA-RMT 2009) at the northern end of the HGLA.

The HGLA lies within the highly active seismic region in the transition zone between the extensional Basin and Range and Eastern California strike slip faulting zone which hosts the Coso geothermal system. One of the most significant faults in the area is the Little Lake fauit (Bhattacharyya and Lees 2002), a northwest trending primarily right-slip fault related to the Sierra Nevada fault system. Seismic activity to the north in the Coso Range is primarily small magnitude (M<5) earthquakes expressing north striking right lateral oblique-slip extension. Seismicity in the Coso field is distinct from the fault-related earthquakes in the valley area and the rest of the Coso Range in that the seismicity is characterized by high decay rates, more numerous seismic events, and transtensional stress.

Although the HGLA is distinguishable from the Coso geothermal area, the high level of seismicity in the HGLA and the presence of the same rocks that have fractured to host the geothermal system suggest that the fracture permeability enabling hydrothermal circulation of the Coso system could also be present in the HGLA.

Figure 3.6-4 Depth to the Heat Source in Coso Geothermal Field



Heat Source

The geophysical anomalies that indicate the presence of a magmatic heat source for the Coso area are thought to be a crystallizing rhyolitic magma at the brittle-ductile transformation. This magma was probably the source of the Pleistocene domes that characterize the Coso Geothermal System, including the 40,000 year old Sugar Loaf Mountain eruption. Several features indicate that this heat source does not extend north and west of the currently exploited Coso geothermal field:

1. The predominant volcanic rock outcropping in the HGLA is older (at 4.5 - 6 million years (Duffiend and Bacon 1980)) than the volcanic rock (at more than one million years) overlying the Coso Geothermal System.

2. The recent resurgence of heat within the Coso geothermal system has been east and south of the current geothermal field (Adams, et al. 2000).

3. At least some of the geophysical anomalies that have been related to the presence of rhyolitic magma at 2.5- 3.7 miles in depth do not extend significantly north of the field. Figure 3.6-4 shows the area based on 3D interpretation of seismic data, relative to the HGLA.

Water Source

The source water for almost all geothermal systems that will feasibly support commercially viable power generation is meteoric water. The original source of the water in the currently exploited Coso geothermal system is meteoric water from the Sierra Nevada or a combination of waters from the Coso Range and the Sierra Nevada. The regional flow of water is northwest to southeast (Williams 2004).

The source water of shallow groundwater in the valley portion of the HGLA, based on water samples from wells, appears to be Sierran waters. The Coso geothermal system may leak to the south and the west (Williams 2004, MHA-RMT 2009), but there is no evidence of leakage to the northwest. The Sierra Nevada appears to be recharging the Rose Valley aquifer along the length of the Rose Valley (MHA-RMT 2009). However, surface springs do not appear to be related to deeply circulating waters within the HGLA. Springs within the Coso Range occur significantly east of the HGLA and do not appear to be recharged by Sierran water but carry the distinct characteristics of non-thermal Coso Range water.

Although the structural location of the HGLA differs from the Coso geothermal system, the active tectonic setting indicates a potential for fractured permeability. The presence of a heat source or the extension of the Coso geothermal system heat source close to or underlying the HGLA has not been proven by the extensive geophysical analysis of the Coso system. Recharge of deep aquifers within the HGLA by Sierran water is consistent with the conceptual model of interbasin flow postulated by several hydrologic models of Rose Valley (Williams 2004, MHA-RMT 2009); however, there is no direct evidence of this.

In summary, the HGLA has similarities and differences with the currently producing Coso Geothermal System. Both areas are underlain by Sierran granitic rocks and are in seismically active areas of high stress. The presence of a shallow magmatic heat source has been identified under the Coso system but is not defined under the HGLA. Sierran water probably recharges aquifers in the HGLA, but the actual depth is unknown.

3.7 BIOLOGICAL RESOURCES

3.7.1 Applicable Regulations, Plans, Policies/Management Goals

A number of federal laws and state regulations provide protection to specific animal and plant species and habitats. In addition, the CDCA and West Mojave (WEMO) Plans provide a number of policies and management goals for specific biological resources occurring in and around the HGLA.

At the federal level, the U.S. Fish and Wildlife Service (USFWS) protects all federally listed threatened, endangered, or proposed, species under the Endangered Species Act (ESA) (e.g., 50CFR 17.11 and 17.12). The USFWS also offers comprehensive protection for migratory bird species under the Migratory Bird Treaty Act (MBTA) (16 USC § 703-711; 50 CFR 10), and additional protection for bald and golden eagles under the Bald and Golden Eagle Protection Act (16 USC 668– 668d, 54 Stat. 250, as amended). It should be noted that the 1978 amendment to the Act authorizes the Secretary of the Interior to permit the taking of golden eagle nests that interfere with resource development or recovery operations. The BLM also has specific management guidelines for raptors, including golden eagles. In addition, the BLM affords protection to select species listed on BLM's "Sensitive Species" list which includes all USFWS-listed and proposed species, and/or species listed under the California Endangered Species Act. It is BLM's policy to provide those species listed on BLM Sensitive Species list the same level of protection that is given USFWS-listed species.

At the state level, the California Department of Fish and Game protects specific species under California's Endangered Species Act (14 California Code of Regulations 670.5). Additional protection is provided to species listed under California's Environmental Quality Act (CEQA) (CEQA Guidelines Section 15380) and under California's Native Plant Protection Act (California Fish and Game Code 1900 et seq.).

These federal and state endangered species program objectives are reflected in the corresponding management goals of the CDCA Plan which identify specific objectives to protect Mojave Desert vegetation communities and wildlife species. The following CDCA Plan goals and objectives pertain to the biological resources of the HGLA:

Vegetation Management Goals

1. 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 the principles of sustained yield.

2. Manage those plant species on the federal and state lists of threatened and endangered species and their habitats so that the continued existence of each is not jeopardized. Stabilize and, where possible, improve populations through management using recovery plans developed and implemented cooperatively with the USFWS and the CDFG.

3. Manage those plant species officially designated as sensitive by the BLM for California and their habitats so that the potential for federal or state listing is minimized. Include consideration of sensitive species habitats in all decisions such that impacts are avoided, mitigated, or compensated.

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

5. Accomplish other resources management objectives by altering plant composition, density, and/or cover including eliminating harmful or noxious plants, increasing livestock or wildlife forage production, and improving wildlife habitat characteristics by maintaining diversified, native plant communities which are favored over monocultures or communities based on non-native species.

Wildlife Management Goals

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

2. Develop and implement detailed plans to provide special management for: a) areas which contain rare or unique habitat; b) areas with habitat which is sensitive to conflicting uses; c) areas with habitat which is especially rich in wildlife abundance or diversity; and d) areas which are good representatives of common habitat types.

Many areas falling into these categories contain listed species, which may become the focus of management.

3. Manage those wildlife species on the federal and state lists of threatened and endangered species and their habitats so that the continued existence of each is not jeopardized. Stabilize and, where possible, improve populations through management using recovery plans developed and implemented cooperatively with the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (CDFG).

4. Manage those wildlife species officially designated as sensitive by the BLM for California and their habitats so that the potential for federal or state listing is minimized.

5. Include consideration of essential habitats of sensitive species in all decisions so that impacts are avoided, mitigated, or compensated.

The HGLA lies within the designated Mojave Ground Squirrel Conservation Area (MGSCA), as identified in the WEMO Plan. Currently the WEMO Plan serves as the Habitat Management Plan for Mojave ground squirrel (*Xerospermophilus Mojavensis*) conservation on BLM-managed lands, as per the CDCA Plan (BLM 2000). The Plan stipulates that permanent new ground disturbance within the MGSCA be limited to one percent (1%) of existing habitat, or a total of 10,387 acres (BLM 2000), over the life of the 30-year plan.

The BLM manages the MGSCA under the same provisions that apply in the Desert Wildlife Management Areas (DWMAs) as identified in the 1992 CDCA Memorandum of Understanding. The following measures identified for DWMAs include "Tortoise Survey Areas" and "No Survey Areas" that apply to the HGLA:

- Within DWMAs, presence-absence surveys and clearance surveys will be required. Tortoises should be moved only by certified/authorized biologists from the immediate area of impact to adjacent suitable habitat (or burrow). In general, tortoises should be moved no further than 1,000 feet from the impact area. The potential for these animals to wander back into harm's way should be taken into account, and the 1,000-foot distance modified by the authorized biologist, as necessary.

- Temporary or permanent fences may be needed to prevent tortoise immigration into the impact area.

The WEMO Plan also addresses birds, and includes specific conservation strategies for the following raptor species: burrowing owl (*Athene cunicularia*), ferruginous hawk (*Buteo regalis*), golden eagle (*Aquila chrysaetos*), long-eared owl (*Asio otus*), and prairie falcon (*Falco mexicanus*). Conservation strategies identified for raptors are incorporated into the Best Management Practices (Appendix A).

3.7.2 Affected Environment

The HGLA is located on the eastern slope of the Sierra Nevada Mountains, in the Coso Range, and in the Rose Valley. It is generally within the western portion of the Mojave Desert area. The western Mojave Desert is generally flat and sparsely vegetated, with creosote bush and saltbush plant communities dominating the landscape (BLM, 2003). Elevations in the Mojave Desert generally vary from approximately 1,355 to 4,440 feet above mean sea level (amsl). Within the HGLA elevations are between about 3,200 feet amsl in the Rose Valley to about 5,700 feet amsl in the Coso Range. Summer temperatures are often greater than 110°F, and winter snow or frost can occur with temperatures below 32°F. Annual precipitation is less than 7 inches (including snowfall) and can be variable from year to year.

3.7.2.1 Vegetation

The Haiwee Geothermal Leasing Area is located at the southwestern edge of the Great Basin Floristic Province and is adjacent to the California Floristic Province and the Desert Floristic Province as described in the *Jepson Manual, Higher Plants of California*. This has resulted in components from all three of these provinces occurring in the area. Most of the study area supports what Sawyer, Keeler-Wolf and Evens, in *A Manual of California Vegetation second edition,* describe as vegetation alliances dominated by shrubs. The description of plant communities follows the classification system provided in *A Manual of California Vegetation.* Scientific names and common names are according to *The Jepson Manual*.

Alliances with creosote bush (*Larrea tridentata*) occupy the majority of the leasing area. Creosote bush occurs both as a dominant in a *Larrea tridentata* Shrubland Alliance and as a codominant in a *Larrea tridentata-Ambrosia dumosa* Shrubland Alliance. Common perennial species found in these alliances include Creosote bush, Burro-bush or Bursage (*Ambrosia dumosa*), Winterfat (*Krascheninnikovia lanata*), Spiny Hop-Sage (*Grayia spinosa*), Desert needlegrass (*Achnatherum (Stipe) speciosa*), Indian ricegrass *(Achnatherum (Oryzopsis) hymenoides)* and Varied bluegrass (*Poa secunda*). Emergent Joshua trees (Yucca brevifolia) also occur in lower numbers within these alliances. This series occurs on alluvial fans, bajadas, and upland slopes having well-drained soils.

Where higher numbers of Joshua trees occur, the vegetation may be classified as a *Yucca brevifolia* Woodland Alliance. In this alliance the Joshua trees may form small stands or be solitary. Cover of Joshua trees would be typically ≥1%. This alliance typically occurs at the upper edge of the creosote alliances so it may include most of the species associated with those alliances. It may also include species from adjacent higher elevation associations including big sage (*Artemesia tridentata*), Black brush (*Coleogyne ramotissia*), Nevada Ephedra (*Ephedra nevadensis*) and green rabbitbrush (*Chrythomnsus viscididiflorus*)

The bottom of the Rose Valley supports an Atriplex polycarpa Shrubland Alliance. This alliance is often considered part of chenopod or saltbush scrub where allscale (*Atriplex polycarpa*) is the dominant shrub in the canopy. Shrubs in this alliance are often less than 3 m tall, with canopies that are either continuous or open. In the HGLA, allscale series usually occurs in sandy soils along the edges of dry lakes, on dissected alluvial fans, and on rolling hills. Common species in this series include allscale (*Atriplex polycarpa*), shadscale (*Atriplex confertiafolia*), and bud sage (*Artemesia spinescens*). The Atriplex polycarpa Shrubland Alliance occurs in larger scattered patches in the central portions of the Haiwee Geothermal Leasing Area.

The shrub alliances typically support an herbaceous layer that may include less than a dozen species of perennial grasses and forbs. In addition the herbaceous layer can include an extremely diverse number of annual forbs and grasses.

Invasive, Non-Native Species

Peter Rowlands et al. (1982) in Brooks (1998) notes that alien species comprise a relatively small portion of the flora in the deserts. They indicate that there approximately 1836 species of vascular plants in the California portion of the Mojave Desert of which 156 (9%) are alien to the region. This compares to the global average of 16% alien plants (Rowlands et al. 1982). Fraga (2005) studied the area immediately south of the Haiwee Geothermal Lease area and found that non-native species comprised 4% of the flora in that area. The non-native species can be classified into three general groups.

The first group is invasive, non-native plants which are common across the landscape. Species in this group are common across the Mojave Desert and many are common in surrounding bioregions as well. These species occur in most portions of allotment and combined, they generally constitute less than 20 % of the total cover. Species in this group include downy brome or cheat grass (*Bromus tectorum*), red bromegrass (*Bromus (rubens) madritensis Ssp. rubens*), Mediterranean grass (*Schismus arabicus and barbatus*), filaree (*Erodium cicutarium*) and tansy mustard (*Descurania sophia*). None of the species in this group are classified as noxious weeds.

The second group of invasive, non-native species is also common in the desert, but is more restricted in the habitats they occupy. For the most part this group is limited to road sides, some washes and other highly modified sites where there is little competition from other plants and water concentrates to provide late season soil moisture. Adequate soil moisture in the late spring and early summer is important for these species. Most of these species are warm season plants. These species occur along paved road corridors through and adjacent to the lease area. Road maintenance practices and equipment play a strong role in maintaining the site disturbance and in spreading seeds of these species. Major species in this group include Moroccan mustard (*Brassica tourenefortii*), Mediterranean mustard (*Hirschfedia incana*), black mustard (*Brassica nigra*). None of these species are listed noxious weeds. Russian Thistle (*Salsola atragus*) is also found in this group and is a "C" rated noxious weed.

The third group of invasive non-native species is species which occur as a series of specific infestations at specific sites. All of these species are listed noxious weeds and have active control efforts in place. A number of these species occur in the region, but none are known to occur within the HGLA.

The introduction of invasive, non-native species, especially noxious weeds is very difficult if not impossible to reverse if not detected early. For that reason, the integrated weed management plan includes detection and prevention plans (USDI BLM 2006b).

3.7.2.2 Fish and Wildlife

As described above, the HGLA supports a number of vegetation communities that provide habitat for a variety of wildlife species.

Mammals

Common mammals known to occur in the HGLA include coyotes, black-tailed jackrabbits, kangaroo rats and pocket mice. Townsend's big-eared bat, a species listed as sensitive by the BLM, has been documented in the area. A number of mammals common to the area have adapted to the high diurnal temperatures by spending much of the day underground, or in aestivation (summer sleep). As a result, the HGLA supports a high proportion of burrowing rodents. Other mammals that may occur include bobcats, antelope ground squirrels and deer mice. Research by P. Leitner southeast of the HGLA documents the presence of the Mojave ground squirrel (Leitner and Leitner 1989, 1990; Leitner et al. 1997), which is listed as an endangered species by the State of California Department of Fish and Game and is a BLM Sensitive Species.

Birds

The generally sparsely vegetated habitats of the HGLA do not support a high diversity of birds. In the vicinity of the HGLA, the largest number of breeding bird species is expected to be found outside its boundaries near South Haiwee Reservoir and Little Lake (BLM 1980).

In general, bird diversity in the HGLA increases during the spring and fall when migrant birds pass through the area enroute to summer breeding or wintering grounds. Many bird species in the greater Haiwee area are seasonal residents, and exhibit seasonal migrations. The USFWS has outlined a plan to conserve and protect migratory birds in its Migratory Bird Strategic Plan 2004-2014. The strategy includes direct collaboration with the BLM in making land use and planning decisions within the Pacific Flyway. Conservation strategies have been identified for migrating birds, and have been incorporated into Appendix A, Best Management Practices.

The distribution of bird species inhabiting the HGLA depends on habitat type. Common passerine species expected throughout much of the HGLA include sage sparrow (*Amphispiza belli*), black-throated sparrow (*Amphispiza bilineata*), California horned lark (*Eremophila alpestris actia*), and verdin (*Auriparus flaviceps*). The number of raptor and owl species differs considerably by season. However, common raptor species in the HGLA include red-tailed hawk (*Buteo jamaicensis*), great-horned owl (*Bubo virginianus*), and American kestrel (*Falco sparverius*). The HGLA avifauna also includes the burrowing owl, a year round resident and BLM Sensitive Species.

Reptiles

Rocky outcrops, bajadas, washes, and gravel plains support a varied herpetofauna, with certain species occurring commonly across most habitats. The HGLA provides these habitats, and supports such species which generally prefer habitats which are warm and arid with sparse vegetation. Common reptiles expected to occur include side-blotched lizard (*Uta stansburiana*), western whiptail (*Aspidoscelistigris*), gopher snake (*Pituophis catenifer catenifer*), red coachwhip (*Masticophis flagellum piceus*), long-nosed leopard lizard (*Gambelia wislizenii*), and zebra-tailed lizard (*Callisaurus draconoides*). Rattlesnakes such as the Panamint rattlesnake (*Crotalus stephensi*) and the Mojave Desert sidewinder (*Crotalus cerastes cerastes*) may also be present. Several of these species have been reported within the California Natural Diversity Data Base at several sites near the HGLA, and may be common throughout the rest of the HGLA (Eremico 2009).

The HGLA is near the northern extent of the range of the desert tortoise (*Gopherus agassizii*). Typical tortoise habitats include creosote, burrobush, saltbush scrub, yuccas, alluvial fans, Joshua tree woodlands, barren washes, shrub-steppe, and blackbrush and juniper woodland ecotones (Berry 2008, USFWS 2008). While it has been historically believed that optimal tortoise habitat occurred in an elevation range of approximately 300 to 900 meters, (1,000 to 3,000 feet) more recent studies and data have found that tortoises may be more abundant at higher elevations than lower elevations. Soils within the tortoise's habitat must be friable for easy burrowing, but still firm enough to prevent burrows from collapsing (USFWS 2008, CDFG 2010). The status of desert tortoises is discussed in greater detail below.

Amphibians

Most of the HGLA does not contain habitat that would support amphibian species. However, the northwest corner of the HGLA, generally in the drainage below the South Haiwee Reservoir and in the area around Rose Spring, may contain ephemeral drainages that could potentially be occupied by amphibians when water is present. Riparian woodlands and wetlands also occur nearby around Little Lake and the South Haiwee Reservoir. Common amphibians that could occur in these areas are California toad (*Anaxyxus boreus halophilus*) and California tree frog (*Pseudacris cadaverina*).

Fish

Because permanent natural surface waters are absent, no fish species occur within the boundaries of the HGLA.

3.7.2.3 Protected and Sensitive Species

Special Status - Plants

Although no biological field surveys were conducted as part of the current analysis of the HGLA, more than 20 species of special status plants are known to occur in the region surrounding the HGLA; none of the special status plant species have been identified within the HGLA. Only two species have a low potential to occur in the HGLA: Ripley's cymopterus and Charlotte's phacelia.

Charlotte's phacelia (*Phacelia nashiana*) is an annual herb in the Waterleaf Family (Hydrophyllaceae). This species blooms during March to June, and occurs on sandy to rocky, granitic slopes, typically in association with Joshua tree woodland, *Larrea tridentata-Ambrosia dumosa* Shrubland Alliance (Mojavean desert scrub) and pinyon and juniper woodland, at elevations of 1,969 to 7,218 feet (Hickman 1993, CNPS 2010). It is a California Native Plant Society (CNPS) California Native Plant Rank species and BLM sensitive species, and its continued existence is reportedly threatened by grazing and mining.

Ripley's cymopterus (*Cymopterus ripleyi* var. *saniculoides*) is a perennial herb. This species occurs on sandy soil, at elevations of 3,200 to 5,312 feet (Hickman 1993, CNPS 2010), typically in association with *Yucca brevifolia* Woodland Alliance and *Larrea tridentata-Ambrosia dumosa* Shrubland Alliance. It is a CNPS California Native Plant Rank species and BLM sensitive species. Ripley's cymopterus is expected to occur in the HGLA (G. Harris, personal communication, 2010).

Special Status - Wildlife

The presence, or potential presence, of special-status species and sensitive biological resources was identified primarily through a literature review and agency contacts. Available records for wildlife species indicate that one federally listed threatened species, one state-listed endangered species, four state-listed threatened species, and five BLM Sensitive Species have been reported for the HGLA or surrounding region. General habitat descriptions for these species are included in Appendix D. The HGLA is not within critical habitat of any federally listed species.

Three special status species are known to occur in the HGLA, including burrowing owl, desert tortoise, and Mojave ground squirrel. Because of their known occurrence and potential to be impacted by future developments, more detailed descriptions of each species are provided below.

Because no field surveys were conducted for this programmatic EIS, the expected status and distribution of these species in the HGLA and vicinity was based on the presence and distribution of potentially suitable habitat, and on existing records. Each species was assigned a "probability to occur" status based on HGLA habitats and their known occurrences in the vicinity. The following definitions for probability of occurrence are used:

- **Present:** Recent observations, potentially suitable habitat and presence confirmed with wildlife agencies.
- **High:** Observed in similar habitat in region by qualified biologists, or often occurs in habitat similar to that on the HGLA, and within the known range of the species.
- **Moderate:** Reported sightings in surrounding region, or site is within the known range of the species, and species often occur in habitat similar to that on the site.
- **Low:** Site is within the known range of the species but onsite habitat is largely unsuitable.
- **Absent:** No suitable habitat noted during field surveys and\or via aerial imagery, or the site is well outside known geographic or elevation ranges.

Burrowing Owl

In California, the burrowing owl is listed as a "Bird of Conservation Concern" by the USFWS, as a "Species of Special Concern" by the CDFG, and as "Sensitive" by the BLM. Its range in California includes most of the state, with its wintering range mainly along the coast and the edges of the Central Valley, its summer range in northeast California, and its year-round range comprising the interior of the Central Valley and most of southern California, including the Mojave and Sonoran Deserts (CDFG 2008). It resides in dry, open habitats, including shortgrass prairies and open patches in annual grasslands, and on disturbed lands, golf courses, airports, and vacant lots. The presence of mammal burrows is a necessary habitat component for burrowing owls (Haug et al. 1993). Burrowing owls also use abandoned tortoise burrows. Burrowing owls are active year-round and, while some may migrate out of the state, most remain as year-round residents of California (CDFG 2008). Burrowing owls are present on a portion of the HGLA.

Several burrowing owl occurrences have been documented in the southern portion of the HGLA as well as within and east of Rose Valley (CDFG 2009). There are at least 53 records of burrowing owls for the WEMO Planning Area, although they are apparently scarce from the eastern Mojave Desert through Inyo County (BLM 2005). The total breeding population in the WEMO Planning Area is estimated to be a few hundred pairs.

Desert Tortoise

The desert tortoise is listed as "Threatened" by the USFWS and the CDFG. Its range includes the Mojave and Sonoran Deserts. It is most common in Mojave creosote bush scrub, desert wash, and Joshua tree habitats, though it occurs in almost every desert habitat below 3,500 feet in elevation. The Desert tortoise requires friable soil for burrowing. Diets typically consist of herbs, grasses, cactus, and wildflowers, and foraging occurs mainly in the spring before aestivation in the summer. Desert tortoises emerge again in the fall with the cooler weather. Aestivation occurs again in the winter (Jennings, 1997). Desert tortoises are expected to occur on the HGLA since a number of local records of occurrence exist (CNDDB 2009), and suitable habitat is present in the northern portion of the HGLA (USFWS 2009).

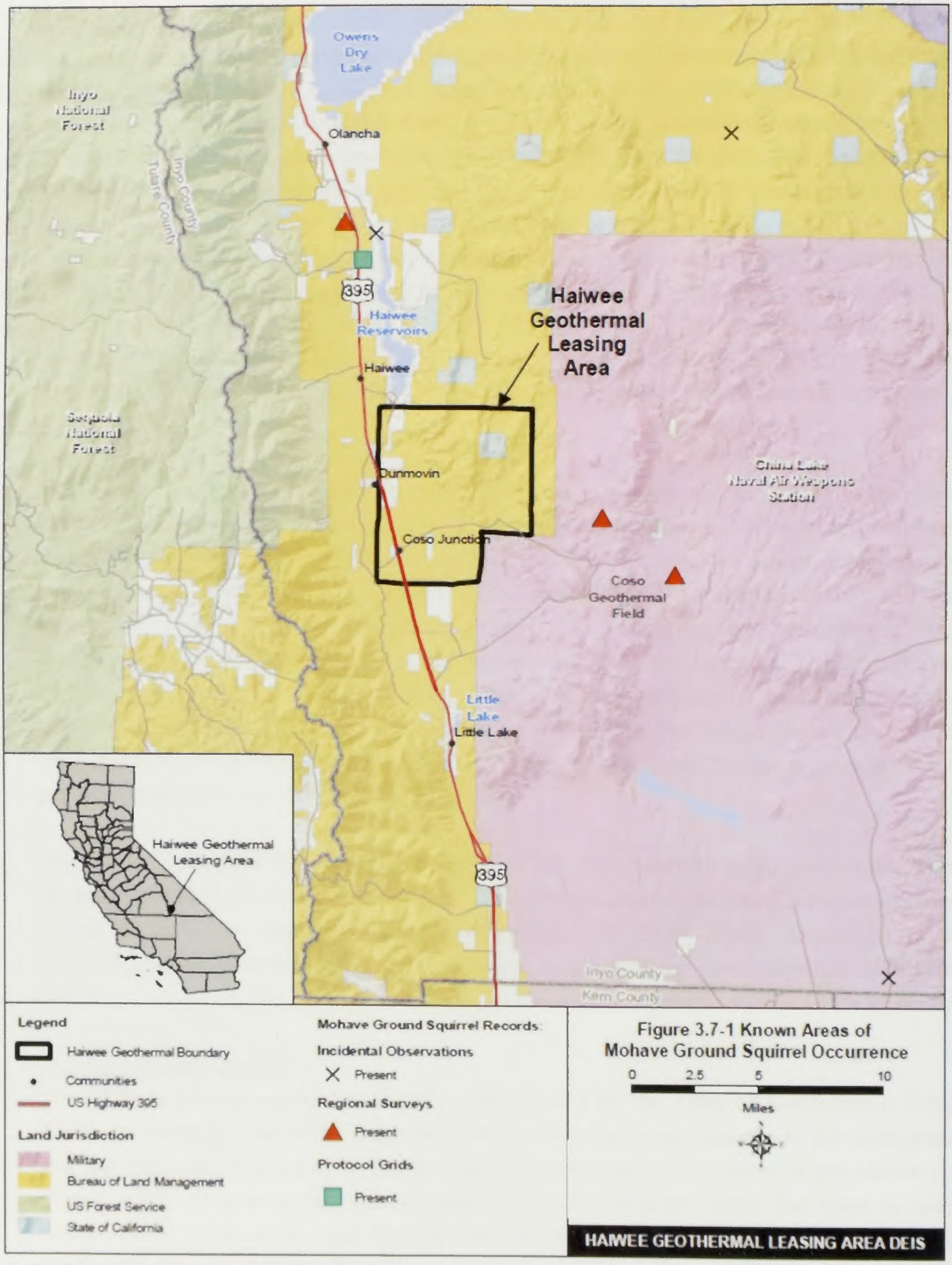
According to the USFWS, the desert tortoise is the only federally listed species that may be present in the HGLA (USFWS 2009). The known range of the desert tortoise includes Indian Wells Valley and Rose Valley (LaBerteaux 2009, BLM 2005). According to the USFWS, desert tortoises also occur in areas dominated by lava substrate (USFWS 2009c).

Mojave Ground Squirrel

The Mojave ground squirrel is listed as Threatened by the State of California (CDFG 2009). Its range extends from Lucerne Valley to the southeast, Olancha to the northwest, and the Avawatz Mountains to the northeast; known areas of occurrence are shown on Figure 3.7-1. It is a diurnal species restricted to the Mojave Desert that lives in open desert scrub, alkali scrub, and Joshua tree woodland, primarily feeding on leaves and seeds of forbs and shrubs. It prefers sandy to gravelly soils, avoiding rocky areas and creating burrows at the base of shrubs for cover and nesting. Mojave ground squirrels enter aestivation in July or August, and emerge from February to June (Bartholomew, Hudson 1960).

The northern part of the Mojave ground squirrel geographic range is in Inyo County, and in the vicinity of Olancha and Haiwee Reservoir (Leitner 2008). Most trapping records come from the Coso region on China Lake NAWS. Two Mojave ground squirrel populations have been monitored at two sites just east of the HGLA in the Coso Range, and research by P. Leitner documents the presence of the Mojave ground squirrel within the HGLA (Leitner and Leitner 1989, 1990; Leitner et al. 1997). In addition, the majority of the HGLA supports potentially suitable habitat (personal communication, Shelley Ellis, BLM). As such, Mojave ground squirrels are expected to occur on portions of the HGLA.

Figure 3.7-1 Known Areas of Mojave Ground Squirrel Occurrence



3.8 CULTURAL RESOURCES

3.8.1 Applicable Regulations, Plans, Policies/Management Goals

A cultural resource is an object or definite location of human activity, occupation, use, or significance identifiable through field inventory, historical documentation, or oral evidence. Cultural resources are prehistoric, historic, archaeological, or architectural sites, structures, buildings, places, or objects and locations of traditional cultural or religious importance to specified social and/or culture groups. Cultural resources include the entire spectrum of objects and places, from artifacts to cultural landscapes, without regard to eligibility for inclusion on the National Register of Historic Places (NRHP) or California Register of Historical Resources (CRHR).

The Cultural Resource Element of the CDCA Plan provides the following goals for the management of archaeological and historical resources. The stated CDCA Plan goals for archaeological and historical resources include:

- 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 a 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 the BLM-authorized actions avoid inadvertent impacts.
- Ensure proper data recovery of significant (National Register quality) cultural resources where adverse impacts cannot be avoided.

The most relevant federal historic preservation law applicable to the HGLA is the NHPA. Section 106 of the NHPA and its implementing regulations (36 CFR part 800) have procedures for considering the effects of proposed federal undertakings on historic properties (i.e., significant cultural resources included or eligible for inclusion on the National Register of Historic Places [NRHP]). Procedures are provided for identifying cultural resources; evaluating their NRHP eligibility; assessing effects; implementing measures to avoid or mitigate adverse effects; and consulting with the Advisory Council on Historic Preservation (ACHP), the SHPO, Native American groups and other interested parties.

3.8.2 Affected Environment

Section 304 of the NHPA and Section 9 of the Archaeological Resources Protection Act (ARPA) provide that information about cultural resources may be kept confidential to protect them from threats, such as looting or vandalism. For this reason, this section provides a general discussion of the nature and extent of cultural resources within the HGLA.

For this EIS, archaeological and historical resources have been divided into two major categories: archaeological sites and architectural resources (or the built environment). Archaeological sites are locations where human activity has measurably altered the earth or left deposits of physical remains (e.g., stone tools, building foundations, bottles, cans). The architectural, or built environment, includes standing buildings (e.g., houses, outbuildings) or intact structures (e.g., dams, canals, bridges). Traditional cultural places (TCPs) are properties that are important to a community's traditional practices and beliefs, and for maintaining the community's cultural identity (Parker and King 1998). A "historic property" is a specific term used to describe any cultural resource - a prehistoric or historic district, site, building, structure, or object – which is included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior.

3.8.2.1 Prehistory

Approximately 10,000 to 20,000 years ago, humans first camped along the ancient rivers and lakes of the Mojave Desert. Early prehistoric groups subsisted on lakeshore plants and animals and on large, now-extinct mammals. By 6,000 BC, the last of these ancient rivers and lakes disappeared due to extreme aridity. The once bountiful grasslands and marshes that occupied the shores of these waters and the large game that visited the lakes and rivers vanished. As a result, prehistoric human populations abandoned low-lying desert areas and moved to upland areas in search of food and water. Around 4,000 BC, the region experienced another shift in climatic conditions from the extreme aridity of the preceding period to the more moderate conditions prevalent today (BLM 2007a). Native Americans adapted to the changing environment by altering food sources, modifying settlement patterns and hunting and gathering strategies, and adopting new tools.

3.8.2.2 Historic Period

Ethnographic Background and Context

During the 18th and 19th centuries, indigenous groups in the California deserts typically had fluid linguistic, cultural, and socio-political boundaries, or no boundaries at all. The HGLA lies within the traditional 19th century territories of the Owens Valley Paiute, the Western Shoshone, the Timbisha Shoshone and the Desert Kawaiisu. All four groups were hunter-gatherers with similar material culture. Each may have lived in or used plants, animals, and other natural resources in the HGLA.

After the Spanish began colonizing coastal California in 1769, indigenous groups, including those far from the coast, were subject to dramatic social, cultural, and demographic changes caused by the establishment of the Spanish mission system and the introduction of new diseases. Indigenous populations declined even further during smallpox epidemics in 1863 and 1870.

Historic Background and Context

Euro-American settlement and development of the region encompasses four major themes – mining, ranching, construction of the Los Angeles Aqueduct, and the development and operation of military facilities.

The discovery of gold in the year 1848 was the beginning of an era in California history marked by an increase in population, trade, and commerce. The Mojave Desert, although remote and inhospitable to most, was as much of a draw for miners as other locations in the state. The first mine in the Mojave Desert was started in 1848 in San Bernardino County, and mining continued elsewhere in the desert, including Inyo County, to this day.

A variety of minerals were extracted from the Mojave Desert, including gold, silver, galena, asbestos, pumice, copper, salt, cinnabar, tungsten, zinc, borax, and lead. Many techniques were employed -- placer mines, stamp mills, shafts, and tunnels. Remnants of all of these practices can be found throughout the Mojave Desert. Although none of the documented mines is in the HGLA, several are located to the north, south, and east. These include Darwin, Coso, the Rand Mining District (including Johannesburg, Red Mountain and Randsburg), Beveridge, Panamint, and the Inyo Mine (Feller n.d.).

In the 1860s, livestock grazing increased in the area. Ranchers used the land primarily for grazing sheep; however, the area was also used for cattle. Much of the sheep use in the area resulted from 'sheep trailing', or the movement of herds from southern winter and spring ranges north through the area to summer ranges. By the 1870s, both cattle and sheep grazing in the area had peaked and begun to decline (Powers 1988; Clel 1972; Harris 2010).

The Los Angeles Aqueduct crosses the northwestern corner of the HGLA and diverts water from the Owens River immediately to the north. Early in its history, the City of Los Angeles recognized that its population growth was rapidly outpacing water availability. In 1904, William Mulholland, the superintendent of the Los Angeles city water company, identified the Owens River as a new source of water for the city. In 1908, construction began on a pipeline and reservoirs that would divert water from this new source. Haiwee Reservoir, north of the HGLA, was the largest of the reservoirs. By 1913 the First Los Angeles Aqueduct was completed. However, by 1924 the water from the Owens River was rapidly disappearing, and the City began to tap the ground water. By the 1930s another location had been identified as a major water source and the Mono Basin Project was born. The Second Los Angeles Aqueduct was built in 1970 (LADWP n.d.).

A Naval Ordnance Test Station (NOTS) was established at China Lake on November 8, 1943. The creation of NOTS was born out of a need for adequate facilities to test and evaluate rockets being developed for the Navy during World War II. The Navy also needed a new proving ground to test other weaponry. Now known as the China Lake Naval Air Weapons Station (NAWS), the northern unit of this facility borders the HGLA

3.8.3 Existing Conditions

3.8.3.1 Cultural Resources in the Vicinity of the HGLA

No field investigations were performed for this EIS. If future geothermal projects are proposed for the HGLA, the BLM will require the permit applicants to perform project-specific inventories for cultural resources in compliance with Section 106 of the NHPA. For this EIS, the analysis of cultural resources in the HGLA was based on background information from a variety of sources, including:

- Records on file at the Ridgecrest Field Office of the BLM.
- Records and field maps at the Eastern Information Center (EIC), a unit of the California Office of Historic Preservation (OHP) California Historical Resources Information System (CHRIS), at the University of California, Riverside.
- The National Historic Landmarks (NHL) Survey of the National Park Service (NPS).
- The online database of the NRHP.
- Information maintained by the OHP on California Historical Landmarks (CHL), properties listed in the California Register of Historical Resources (CRHR), and California Points of Historical Interest.
- A list provided by the EIC of the CRHR and NRHP eligibility status of archaeological resources in Inyo County.
- Information obtained through consultation with consulting parties, including Indian tribes.

National Historic Landmarks

NHLs are nationally significant historic places designated by the Secretary of the Interior for their exceptional value or quality in illustrating or interpreting the heritage of the United States. Two NHLs are located in Inyo County:

- Manzanar War Relocation Center, along US 395 north of Lone Pine, 45 miles north of the Haiwee leasing area.

- Coso Rock Art District, located within China Lake NAWS about 10 miles east of the HGLA.

National Register of Historic Places

To be listed in or considered eligible to the NRHP, a cultural resource must be significant under criteria established by the Secretary of the Interior in 36 CFR 60.4. The NRHP online database was reviewed on November 13, 2009, to determine whether any NRHP-listed properties are in or near the HGLA. Listed properties in the vicinity include:

- Coso Rock Art District, within China Lake NAWS east of the HGLA (also an NHL).

- Ayers Rock Petroglyph Site (CA-INY-134), less than one mile from the HGLA.

- Coso Hot Springs, on China Lake NAWS, east of the HGLA.

- Fossil Falls Archaeological District, in the Little Lake vicinity south of the HGLA.

California Historical Landmarks

CHLs are buildings, structures, sites, or places determined to have statewide historical significance. CHLs numbered No. 770 and higher are also automatically listed in the CRHR.

The list of CHLs maintained by the OHP was reviewed on November 13, 2009. The list identifies 21 CHLs in Inyo County, only two of which are located in the vicinity of the HGLA:

- Farley's Olancha Mill Site (No. 796) near Olancha, about 10 miles north of the HGLA.
- Fossil Falls Archeological District (No. N888), near Little Lake about four miles south of the HGLA (also listed in the NRHP).

California Register of Historical Resources

The State Historical Resources Commission has designed the CRHR program for use by state and local agencies, private groups, and citizens to identify, evaluate, register, and protect California's historical resources. Based on the OHP's list of Inyo County resources on the CRHR, the only ones listed are the two CHLs in the vicinity, Farley's Olancha Mill and Fossil Falls Archaeological District, both well outside the HGLA.

California Points of Historical Interest

California Points of Historical Interest are sites, buildings, features, or events of local (city or county) significance and have anthropological, cultural, military, political, architectural, economic, scientific or technical, religious, experimental, or other value. Points of Historical Interest designated after December 1997, and recommended by the State Historical Resources Commission, are also listed in the California Register.

Information on California Points of Historical Interest was obtained from the OHP's web site. Of nine Points of Historical Interest in Inyo County, none are within or near the HGLA.

BLM Areas of Special Designation

In 1985, the BLM established the Rose Spring Area of Critical Environmental Concern (ACEC) to protect significant prehistoric archaeological sites for scientific use and public interpretation. Portions of the Rose Spring ACEC are within the HGLA.

Sites of Religious or Cultural Significance to Indian Tribes

Information about sites that Indian tribes attach religious or cultural significance is generally identified through existing ethnographic information and consultation with Indian tribal governments. No specific TCPs, archaeological sites, locations of important historic events, sacred sites, and sources of raw material used to make tools or sacred objects, or traditional hunting and gathering areas have been identified within the HGLA in the ethnographic literature or through consultation.

3.8.3.2 Recorded Cultural Resources within the HGLA

Previous Surveys

A review of previous cultural resource surveys within the boundaries of the HGLA shows that 1,500 to 2,000 acres out of the total area of over 24,000 acres, or six to eight percent, have been systematically and intensively surveyed for cultural resources. Because of the small amount of intensive survey, most cultural resources in the HGLA are not expected to have been identified.

Known and Recorded Cultural Resources

Maps at the BLM Ridgecrest Field Office and the EIC in Riverside show at least 218 cultural resources within the boundaries of the HGLA, most of which are archaeological sites. Most of these cultural resources have not been evaluated for NRHP eligibility. Twenty cultural resources have been either recommended as eligible, or determined eligible, for listing in the NRHP. There are 110 cultural resources for which chronological information is available, 95 of which are exclusively prehistoric archaeological sites and seven of which are historic archaeological sites. Eight sites contained both historic and prehistoric archaeological components. The majority (about 80 percent) of the prehistoric archaeological sites can be characterized as lithic scatters, or surface scatters of chipped stone flakes and tools. They range in size from small, low density surface scatters to archaeological sites containing thousands of obsidian flakes. Fourteen percent of the prehistoric archaeological sites also had milling features (for grinding plant foods). Other prehistoric archaeological sites have ground stone artifacts, rock shelters, rock cairns, or evidence of quarrying. Two previously recorded archaeological sites reported the presence of human remains or burials.

A notable prehistoric archaeological site within the HGLA is site CA-INY-372. This site contains a large and diverse concentration of lithics, groundstone, features, and other diagnostic artifacts. The age of the occupations at the site extend from approximately 1950 BC to AD 1700. The site has been severely impacted by looting and vandalism, as well as construction of the Los Angeles Aqueduct, but intact portions of the site remain. Under the guidance of the CDCA Plan, an area surrounding and including the site has been established as an ACEC by the BLM.

Recorded historic period resources are much less common in the HGLA than prehistoric archaeological resources. Historic period cultural resources that have been recorded within the planning area include a trail, mining and other debris, a rock wall, graffiti, and wooden structures. One architectural resource, the Haiwee Power Plant, lies north of the HGLA.

Judging from known and recorded historic period cultural resources in the HGLA, most unrecorded historic period resources are expected to be related to mining, the construction of the Los Angeles Aqueduct, or construction or use of thoroughfares such as the Coso Junction Road and railroads.

Based on the distribution of known cultural resources and the limited number of past surveys in the HGLA, it is anticipated that the portion of the leasing area most likely to contain significant cultural resources would include Rose Valley, especially near existing or former lakes. In the hills to the east, locations near springs and along drainages would be most likely to contain significant archaeological resources, while very steep terrain and locations far from drainages would be less likely to have supported past human activities and have little surviving physical evidence of past activities.

3.9 PALEONTOLOGY

3.9.1 Applicable Regulations, Plans, Policies/Management Goals

The Cultural Resource Element of the CDCA Plan identifies the following general goals for the management of Paleontological Resources:

- Ensure that paleontological resources are given full consideration in land use planning and in 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.

Federal laws that protect paleontological resources include NEPA, FLPMA, and the Paleontological Resource Preservation Act (PRPA) (Public Law 111-011 Subtitle D). PRPA was passed as part of the Omnibus Public Land Management Act of 2009. Land managing agencies are currently in the process of developing guidelines and procedures to implement PRPA. Several key features of PRPA include the definition of paleontological resources, a mandate to manage paleontological resources on federal lands using scientific principles and expertise, criteria for issuing permits to collect paleontological resources, definitions of specifically prohibited acts, specific penalties for violations, and an exemption of specific paleontological locality data from Freedom of Information Act (FOIA) requests. Overall, PRPA gives federal land managing agencies the authority to specifically protect and manage paleontological resources on federal lands.

3.9.2 Affected Environment

Paleontological resources, or fossils, are the remains or traces of once-living organisms preserved in rocks and sediments. Such resources include bones, teeth, shells, wood, leaf impressions, footprints, burrows, and microscopic remains, among others. Fossils are considered non-renewable resources because the organisms from which they derive no longer exist. Once destroyed, a fossil can never be replaced.

Fossils are important because they are used to understand:

- Extinction and speciation.

- The relationships between extinct organisms and modern species.
- Ancient environments, climate change, and paleo-ecology.
- Geologic dating, which is an independent and line of evidence for isotopic dating.
- The geographic distribution of organisms.
- Tectonic movements of land masses and ocean basins.

3.9.3 Existing Conditions

No paleontological field investigations were performed for this EIS.

Occurrences of paleontological resources are closely tied to the geologic units (i.e., formations, members, or beds) that contain them. The probability of finding paleontological resources can be broadly predicted from the geologic units present at or near the surface. For example, the Pliocene (4.8 to 3.0 million years ago) Coso Formation in Death Valley is known to contain fossils of mastodon, horse, zebra, peccary, and dog. Coso Formation deposits are found in the eastern part of the HGLA (Whitmarsh 1997), although fossils have not been reported in that area. Pleistocene (2.6 million years ago to 12,000 years ago) fossils have been found at Owens Lake north of the HGLA.

Fossil discoveries in the immediate vicinity of the HGLA are rare (D. Storm 2009, personal communication). However, a mammoth fossil was reportedly collected at the dam site of North Haiwee Reservoir (two miles north of the HGLA) by William Mulholland during construction of the Los Angeles Aqueduct (Cogstone 2007).

Despite its name, Fossil Falls Archaeological District does not contain fossils. The feature was formed 20,000 years ago when glacial meltwater from Owens Lake was forced over much older basalt flows.

Overall, there appears to be very little potential for the occurrence of paleontological resources within the HGLA (D. Storm 2009, personal communication). The reasons are:

1. The Sierra Nevada to the west is granitic.
2. The Coso Range to the east is mostly volcanic.
3. The valley floor is mostly Pleistocene and Holocene alluvial and fluvial deposits.

4. The remainder of the valley floor is Coso volcanics with basalts and rhyolite.

5. Owens River gravel deposits are too young to contain paleontological material.

3.10 VISUAL RESOURCES

3.10.1 Applicable Regulations, Plans, Policies/Management Goals

The following federal, state, and local laws, ordinances and regulations (LORs) provide guidelines for the management of visual resources in the HGLA.

3.10.1.1 Federal - Bureau of Land Management Ridgecrest Field Office

California Desert Conservation Area Plan of 1980, as Amended
The Ridgecrest Field Office is part of the California Desert District, which is included in the CDCA. The California Desert Conservation Area Plan of 1980, as amended, states in Chapter 3, Recreation Element, Visual Resources Management Program page 72 that:

- "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."

West Mojave Plan (2006)
The West Mojave Plan Record of Decision (2006) and the Final Environmental Impact Report and Statement for the West Mojave Plan (2005) do not include regulations or standards pertaining to visual resources.

3.10.1.2 Applicable State Regulations

California Environmental Quality Act (CEQA)
CEQA was enacted in 1970. CEQA provides a process for determining a program or action's potential effect on the environment, and developing measures to minimize those effects. California Public Resources Code, Section 21060.5 states that "Environment means the physical conditions which exist within the area which will be affected by a

proposed project, including land, air, water, minerals, flora, fauna, noise, and objects of historic or aesthetic significance."

To determine the significance of potential effects under CEQA, Appendix G of the Act was referenced. The guidelines indicate that a program or project will have a significant effect on the environment in relation to visual resources if it will:

- Have a substantial, adverse effect on a scenic vista.
- Damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway.
- Substantially degrade the existing visual character or quality of the site and its surroundings.
- Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

California Scenic Highway Program

The goal of the California Scenic Highway Program is to preserve and enhance the natural beauty of California. California contains several distinct landscape regions and the merits of a particular landscape are considered within the context of its own region. The highway should traverse an area of outstanding scenic quality, containing striking views, flora, geology, or other unique natural attributes. Therefore, Caltrans evaluates the merits of a nominated highway on how much of the natural landscape a traveler sees and the extent to which visual intrusions impact the "scenic corridor." Visual intrusions may be natural or constructed elements, viewed from the highway, that adversely affect the scenic quality of a corridor. Adverse affects are characterized as minor, moderate, or major. Visual intrusions are evaluated in the following manner:

- The more pristine the natural landscape is and less affected by intrusions, the more likely the nominated highway will qualify as scenic.
- Where intrusions have occurred, the less impact they have on an area's natural beauty, the more likely the nominated highway will qualify as scenic.
- The extent to which intrusions dominate views from the highway will determine the significance of their impact on the scenic corridor.

Scenic highway nominations are evaluated using the following criteria:

- The state or county highway consists of a scenic corridor that is comprised of a memorable landscape that showcases the natural scenic beauty or agriculture of California.

- Existing visual intrusions do not significantly impact the scenic corridor.

- Demonstration of strong local support for the proposed scenic highway designation.

- The length of the proposed scenic highway is not less than a mile and is not segmented.

When Caltrans determines a proposed scenic highway satisfies these qualifications, the local governing body, with citizen support, must adopt a program to protect the scenic corridor. The zoning and land use along the highway must meet the state's legislatively required elements for scenic highway corridor protection.

An eligible highway may be nominated for official designation by the local governing body with jurisdiction over the lands adjacent to the proposed scenic highway. The application to nominate eligible scenic highways for official designation requires the preparation of a visual assessment and Scenic Highway Proposal. The proposal must include a letter of intent from the local governing body, topographic and zoning maps, and a narrative description of the scenic elements in the corridor that includes a discussion of any visual intrusions on scenic views.

This step requires the local governing body to develop and adopt protection measures in the form of ordinances, zoning, and/or planning policies that apply to the area of land within the scenic corridor. When there is more than one governing body involved, each jurisdiction shall jointly submit protection measures. An effective protection program ensures that activities within the scenic corridor are compatible with scenic resource protection and consistent with community values, while still allowing appropriate development. The five legislatively required elements of corridor protection are:

- Regulation of land use and density of development (i.e., density classifications and types of allowable land uses);

- Detailed land and site planning (i.e., permit or design review authority and regulations for the review of proposed developments);

- Control of outdoor advertising (i.e., prohibition of off-premise advertising signs and control of on-premise advertising signs);

- Careful attention to and control of earthmoving and landscaping (i.e., grading ordinances, grading permit requirements, design review authority, landscaping and vegetation requirements); and

- The design and appearance of structures and equipment (i.e., design review authority and regulations for the placement of utility structures, microwave receptors, wireless communication towers, etc.).

3.10.1.3 Applicable Local Regulations

Inyo County General Plan (2001)

Lands under private ownership exist within and adjacent to the HGLA. Applicable management plans and policies for these lands include the Inyo County General Plan (Inyo County 2001). As Inyo County has no direct land use jurisdiction over public lands, the General Plan is not directly applicable to activities proposed on public lands. However, private lands scattered and adjacent to the HGLA are under Inyo 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.

The Inyo County General Plan includes goals, policies, and implementation measures pertaining to visual resources. Chapter 7, Circulation Element, Section 7.3, Scenic Highways, includes goals policies and implementation measures that address issues related to scenic highways. Chapter 7 Section 7.3.4 Policy SH-1.3, Expand Scenic Route Designations states the following:

> The County will work with Caltrans to obtain scenic route designations on all portions of US 395 and State Roads 168 and 190. The County should also work with Caltrans to identify and have designated other scenic corridors in the County.

Chapter 8 Conservation/Open Space Element Section 8.8, Visual Resources, covers the protection of visual resources in Inyo County. Goal VIS-1 states the following:

> Preserve and protect resources throughout the County that contribute to a unique visual experience for visitors and quality of life for County residents.

3.10.2 Affected Environment

The HGLA is bounded by the Sierra Nevada Mountains, which rises steeply to the west and the Coso Range to the east. The China Lake NAWS is located to the east and South Haiwee Reservoir is located to the north. The elevation ranges from 1,355 to 4,440 feet above mean sea level.

The visual resources inventory describes the regulatory framework for managing visual resources in the HGLA, landscape character of the region, scenic quality of the landscape, visibility of the landscape from sensitive viewpoints (e.g., communities, recreation and preservation areas, and roadways), and BLM visual resource inventory and visual resource management classes.

The BLM conducted a Visual Resource Management Inventory study in the fall of 2009 to determine visual management goals for the HGLA and incorporate the results into this EIS as well as use them for future planning decisions in the area (Clayton 2009). The Visual Resource Management Inventory report generated by this study identified scenic quality rating units, sensitive viewpoints, and Visual Resource Inventory (VRI) classes for the HGLA, which the BLM may establish as interim Visual Resource Management (VRM) classes in this EIS.

In addition, the Cultural Resources section of this document (Section 3.8) identified several cultural resources within or near the HGLA that may be sensitive to changes in visual setting. These are discussed briefly below.

3.10.1.4 Inventory Methods

Visual resources were inventoried within the HGLA. The study was conducted in compliance with the BLM Visual Resource Management Inventory and Contrast Rating System (BLM 1986a and b). The visual resources inventory consisted of the following sequence of tasks:

- Review of the regulatory framework in place for the HGLA;
- Review of the previously completed the BLM Visual Resource Management Inventory for the HGLA, including VRI classes and scenic quality classes (Clayton 2009);
- A review of the regional physiography and landscape character;
- Identification of sensitive viewpoints; and
- Identification of distance zones and visibility from sensitive viewpoints.

3.10.1.5 Data Sources

Visual resources data was obtained from the Visual Resource Management Inventory (Clayton 2009). Visual resource data was collected from agency and government publications including the BLM Ridgecrest Field Office, CDCA Plan of 1980, as amended, and the Inyo County General Plan (2001); agency websites including the BLM Ridgecrest Field Office website, the Inyo National Forest Website, the Inyo County website, and the California Department of Transportation website; and GIS data sets including Inyo National Forest mapping, base mapping previously collected by POWER Engineers (roadways, topography, transmission lines, jurisdiction and ownership, etc.), and GIS data sets from the Visual Resource Management Inventory. Aerial photography and topography modeling from Google Earth was also reviewed. Field reconnaissance was conducted during the Visual Resource Management Inventory. No additional field reconnaissance was conducted for this EIS.

3.10.1.6 Data Categories

Regional Setting and Landscape Character

The inventory of the aesthetic value of the landscape began by examining the physiography and cultural modifications of the region. Physiography, also referred to as geomorphology, is the classification of landforms according to their geologic structures and histories into three tiers: divisions, provinces and sections. Patterns of cultural modification were also identified and categorized.

The HGLA, while within the Mojave Desert geographic area, additionally occupies two physiographic provinces. The majority of the HGLA is within the Great Basin Section of the Basin and Range Province while the southwest corner of the HGLA is within the Sierra Nevada Section of the Cascade-Sierra Mountains Province.

The HGLA is generally comprised of undeveloped desert with naturally-vegetated areas. US 395, a primary north-south highway, traverses the Rose Valley, the Coso-Gill Station Road traverses the area from west to east, and several unimproved roads also provide access to the area. A number of small communities are also located within and/or in the vicinity of the action area. These communities include Olancha, Haiwee, Dunmovin, Coso Junction and Little Lake.

Basin and Range Province

Great Basin Section

The Great Basin Section is characterized as "isolated ranges (largely dissected block mountains) separated by aggraded desert plains" (Fenneman 1931). The region generally consists of an alternating pattern of linear mountain ranges and desert valleys, created by roughly north-south trending faults, with the mountains typically occupying half of the surface area. The ranges are typically 50 to 75 miles in length, with jagged crests that tend to be relatively even in height and width. The Great Basin has no external outlet, consisting of independent basins with water features generally consisting of internally drained streams and ephemeral playa lakes on the valley floor of each drainage. Vegetation in the valleys tends to be sagebrush where absolute desert conditions do not occur. The mountains are typically desert, although pinyon or dwarf cedars, mountain mahogany, and yellow pine may occur on the slopes where conditions are favorable and adequate water is available.

Predominant natural communities may include the Big sagebrush series, Singleleaf pinyon series, Utah juniper series, Low sagebrush series, Shadscale *series, Atriplex confertifolia* alliance, Mixed saltbrush series, and Bristlecone pine series (USFS Pacific Southwest Region ND). Most of these communities do not occur in the project area, but may, in some cases, be visible from within the HGLA.

Cascade- Sierra Mountains Province

Sierra Nevada Section

The Sierra Nevada Section is characterized as "block mountain range tilted west; accordant crests; alpine peaks near east side" (Fenneman 1931). The area consists of a mountain barrier, with an average width of 50 to 60 miles, between the plateaus on the east and the Pacific valleys on the west. The range consists primarily of granitic rock. Unlike the northern portion of the Sierra Nevada, the southern portion (where the HGLA is located) contains little evidence of past glaciation.

Predominant natural communities in this section may include the Mixed conifer series, Ponderosa pine series, Jeffrey pine series, White fir series, Red fir series, Lodgepole pine series, Huckleberry oak series, Western Juniper series, Aspen series, Big sagebrush series, Mixed subalpine forest series, Mountain hemlock series, Whitebark pine series and Giant sequoia series (USFS Pacific Southwest Region ND). These communities do not occur in the project area, but may, in some cases, be visible from within the HGLA.

Scenic Quality

Scenic quality mapping was obtained from the Visual Resources Management Inventory (Clayton 2009).

Scenic quality is a measure of the visual appeal of a tract of land. The BLM uses a numerical rating system to determine scenic quality classes. The system classifies the landscape into three levels of scenic quality: Class A, Class B, and Class C using seven key factors: landform, vegetation, water, color, adjacent scenery scarcity, and cultural modifications. The three classes of scenic quality are defined as follows:

Class A – Distinctive
Areas where characteristic features of landform, rock, water and vegetation are distinctive or unique in the context of the surrounding areas. These features exhibit considerable variety in form, line, color and texture and have strong positive attributes of unity and intactness.

Class B – Above Average
Areas in which features provide variety in form, line, color and texture. Although the combinations are not rare in the surrounding region, they provide sufficient visual diversity to be considered moderately distinctive. These features exhibit more common variety in form, line, color and texture and have positive, but more common attributes of unity and intactness.

Class C – Common
Areas where characteristic features have moderate to little variety in form, line, color and texture in relation to the surrounding region.

Sensitive Viewpoints

Potentially sensitive viewpoints, referred to as Key Observation Points (KOPs) in the BLM Visual Resources Management methodology, were identified through agency websites including the BLM Ridgecrest Field Office website, the Inyo National Forest website, and the California Department of Transportation website; land use data; and written and oral scoping comments.

Viewpoints considered include:

- Communities – identified by the land use inventory undertaken for the HGLA.
- Recreation and preservation areas – existing and proposed developed recreation sites, parks or areas used for camping, picnicking or other recreational activities.
- Sensitive travel corridors – proposed or designated scenic or historic highways or byways and recreation destination routes.

- Cultural resources that may be sensitive based on visual resources sensitivity criteria as defined below.

Potential effects to the visual setting of National Historic Landmarks, National Register historic districts and sites, and sites nominated to or designated by the State Historic Preservation Officer are further addressed in the Cultural Resources Section (3.8).

Isolated or dispersed rural residences may occur in or near the HGLA. These isolated residences were not inventoried. However, residences are typically considered highly sensitive to visual change and should be inventoried and assessed in detail for any future action related to geothermal resource development within the HGLA.

The visual sensitivity of identified viewpoints was evaluated and rated as high, moderate, or low, following established BLM criteria. Criteria are listed below in Table 3.10-1.

Table 3.10-1 Visual Sensitivity Criteria Definitions

Criteria	High	Moderate	Low
User Type/ Attitude	High expectations for maintaining scenic attractiveness (i.e. residences)	Users are concerned for scenic attractiveness but it is not the primary focus of their experiences (i.e., dispersed recreation areas, which are areas where recreation activities may be performed but no designated facilities exist, and general travel corridors).	Areas where the public has low expectations for maintaining scenic attractiveness. Generally commercial or industrial areas where human caused modifications dominate the landscape.
Duration of View	Fixed or continuous views – Long	Intermediate views (i.e., open highway views)	Brief or intermittent views (i.e. highway views in rolling landscapes) – Short
Use Volume	High level of use	Moderate level of use	Low level of use

Visual Sensitivity

Visual sensitivity, or sensitivity level, is defined as a measure of viewer concern for the scenic resource and potential changes to the resource. The BLM identifies KOPs, or sensitive viewpoints by identifying the most critical viewpoints and then considering angle of observation, number of viewers, length of time the project is in view, relative project size, season of use, and light conditions for each viewpoint. The factors most relevant to this study have been condensed into the following criteria to identify sensitivity levels for potential viewpoints.

User type/attitude considers the local, regional or national significance or importance of a viewpoint or viewed area. As an example, national park or wilderness area viewpoints are typically considered more sensitive than an interstate highway.

Duration of view is defined as the length of time that a sensitive viewer would typically encounter a particular view. For example, a view from a residence is considered to be a high duration view because the landscape could be viewed at any time of day and for any length of time. Alternatively, the amount of time the commuter would see an area of landscape from a highway as they drive through the area would be very short, and thus would be considered a short duration view.

Use volume considers the number of users. As an example, a busy arterial road would have a higher volume of users than a small local street.

The combination of user type/attitude, use volume, and duration of view produced an overall sensitivity level of high, moderate, or low that was subsequently used in the visual analysis (see Table 3.10-1). See Table 3.10-2 for a complete list of viewpoints and sensitivity levels. Potential visual impacts were assessed for high sensitivity viewpoints.

Table 3.10-2 Sensitive Viewpoints

Viewpoint	User Type/ Attitude	Duration of View	Use Volume	Visual Sensitivity	Comments
Communities*	High	Long	Moderate	High	Includes Olancha, Haiwee, Dunmovin, Coso Junction and Little Lake
Travel Corridors					
US 395	High	Short	High	High	State Identified Eligible Scenic Highway*
Coso-Gill Station Road	Moderate/Low	Short	Low	Low	
Unimproved/4WD Roads	Moderate/Low	Short	Low	Low	
Mine Haul Roads	Low	Short	Low	Low	
Recreation and Preservation Viewpoints					
Little Lake Overlook*	High	Long	Low	High	California Watchable Wildlife Site

Viewpoint	User Type/ Attitude	Duration of View	Use Volume	Visual Sensitivity	Comments
Fossil Falls*	High	Long	Low	High	One of the Ridgecrest Field Office's 'Top 10 Points of Interest;' campground and trail at site
Sacatar Trail Wilderness*	High	Long	Low	High	Access from the east is via the Sacatar Trail.
Coso Range Wilderness*	High	Long	Low	High	
South Sierra Wilderness*	High	Long	Low	High	
Haiwee Trail*	High	Long	Low	High	Trail accesses Kern River Wild and Scenic River and South Sierra Wilderness
Pacific Crest Trail*	High	Long	Low	High	
Kennedy Meadows Campground*	High	Long	Low	High	Campground provides access to the Pacific Crest Trail
Kern River Wild and Scenic River	High	Long	Low	High	
South Haiwee Reservoir	N/A	N/A	N/A	N/A	The reservoir has been closed to public access.
Cultural Resource Viewpoints					
Rose Spring ACEC	Moderate/Low	Long	Low	Low	Designated for important and irreplaceable cultural resources, especially archaeological.
Ayers Rock Petroglyph Site	Moderate	Long	Low	Moderate	
Coso Hot Springs*	High	Long	Low	High	
Fossil Falls Archeological District*					See Recreation and Preservation Viewpoints

*High sensitivity viewpoints included in the visibility analysis

Visibility and Distance Zones
Distance zones identified by the BLM in the VRM methodology were used for this report. These distance zones are as follows:

- ***Foreground-Middleground Zone*** (0 to 3 - 5 miles): This is the area where management activities might be viewed in detail. The outer boundary of this distance zone is defined as the point where the texture and form of individual plants are no longer apparent in the landscape.

  Perception of detail and dominance of the landscape typically changes greatly between the origin of the foreground-middleground distance zone and its outer boundary. To provide more detailed visibility inventory information, the distance zone has been divided into the following sub zones.

  - ***Foreground Zone*** (0 to 0.5 mile)
  - ***Middleground Zone*** (0.5 to 3-5 miles)

- ***Background*** (3 - 5 to 15 miles): This is the remaining area which can be seen. Areas which are so far distant that the only thing discernible is the form or outline are not included. In order to be included within this distance zone, vegetation should be visible at least as patterns of light and dark.

- ***Seldom Seen***: These are areas that are not visible within the foreground-middleground and background zones, and areas beyond the background zones.

VRM/VRI Classes
Visual resources on BLM lands are managed under the VRM system. VRM Classes define the acceptable degree of visual change allowed in a given landscape. The BLM derives visual management objectives for their lands by evaluating and overlaying the elements of landscape scenic quality with viewer sensitivity and visibility from viewpoints in a given area. The BLM has four VRM Classes to manage visual resources on public lands. The BLM utilizes the VRM system to establish guidelines on managed lands that allow for various levels of change as typically detailed in the BLM Resource Management Plans (RMPs). VRM Classes are as follows:

Class I
The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited

management activity. The level of change to the characteristic landscape should be very low and must not attract attention.

Class II
The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Class III
The objective of this class is 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.

Class IV
The objective of this class is to provide for management activities which require major modifications 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.

3.10.1.7 Existing Conditions

Scenic Quality
Refer to Figure 3.10-1 for scenic quality mapping completed for the Visual Resource Management Inventory. Four Scenic Quality Rating Units (SQRU) were mapped, rated, and described in the Visual Resource Management Inventory (Clayton 2009). SQRUs 01 and 02, which make up the majority of the HGLA, were identified as Class C. SQRUs 03 and 04, which are located in the northeast corner of the HGLA, were identified as Class B. The SQRUs were described as follows.

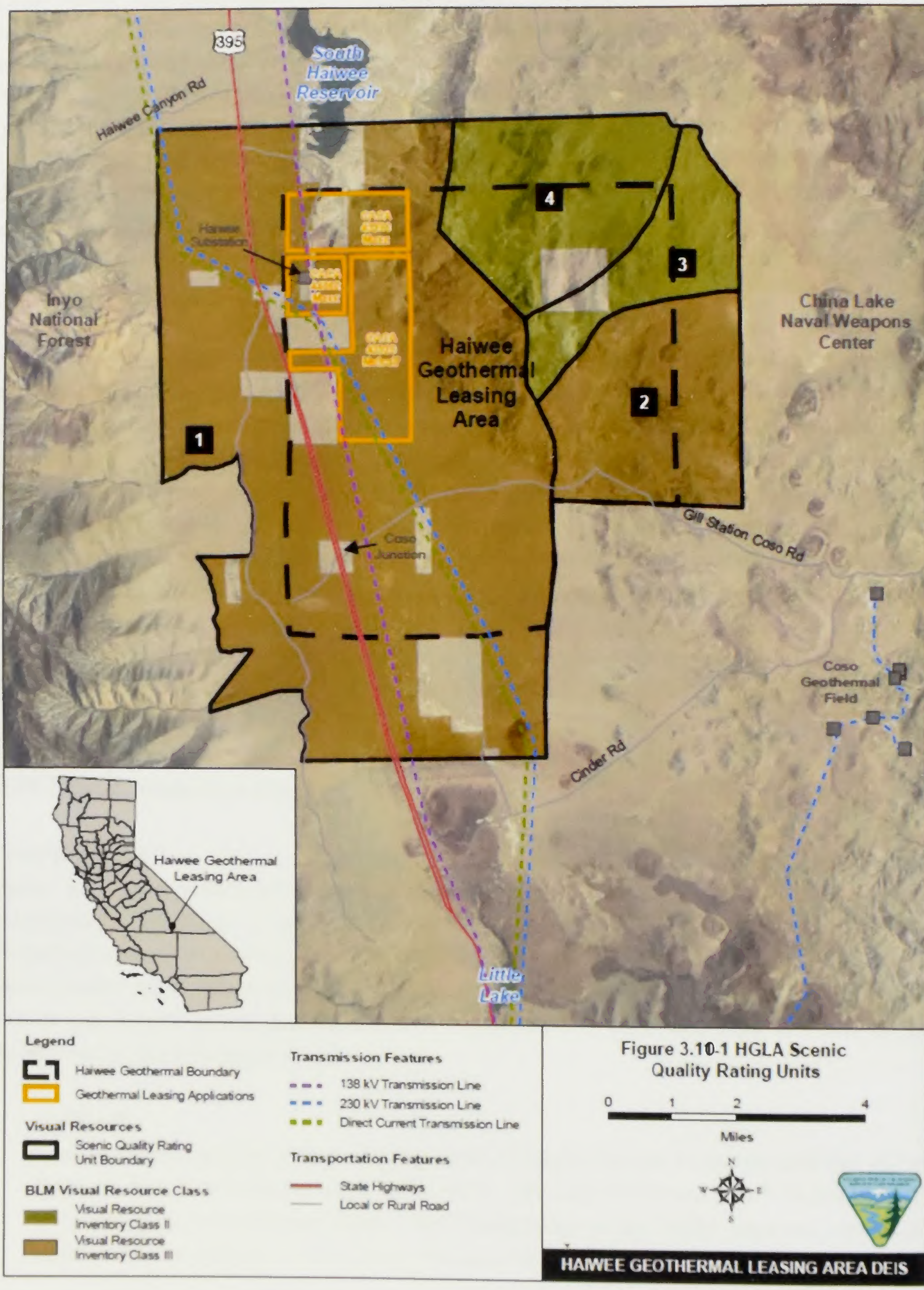
SQRU 01
Encompasses a portion of Rose Valley south of South Haiwee Reservoir and east of Inyo National Forest and Sacatar Trail Wilderness. The unit is bisected (north to south) by US 395 and several transmission lines. The western edge of the Valley (and unit) is visually defined by the abruptly rising Sierra Nevada Mountains. The eastern boundary of the

unit is generally defined by the north-south trending ridges and low hills that parallel US 395, three to four miles to the east. The landscape is generally flat, high desert valley with grass and low-growing shrubs of muted brown, tan and green color tones. Also visible (from some vantage points) are several electric transmission lines with complex structural forms and industrial character, and the linear, horizontal form of US 395. Three transmission lines, consisting of a 138 kV line, a 230 kV line, and a 500 kV DC line cross the unit from northwest to southeast. The unit is bordered by rugged, rocky ridges and rolling hills to the east. More distant mountain ranges (Sierra Nevada Mountains to the west and Coso Range to the east) provide a backdrop of visual interest though they are not part of this unit.

SQRU 02

Encompasses an area of low hills and ridges just east of Rose Valley and northeast of Coso Junction. The landscape is generally composed of low, rolling hills with grass and low-growing shrubs and Joshua trees. Colors tend to be muted tones of brown, tan and green. The unit is crossed by several haul roads that service mining operations within and to the east of Unit 02. While built features are generally absent from SQRU 02 (aside from the haul roads), this unit is substantially influenced by the noticeable and frequent haul vehicles passing through the unit. This truck traffic generates considerable dust, which covers much of the vegetation adjacent to the haul roads.

Figure 3.10-1 HGLA Scenic Quality Rating Units



SQRU 03

Encompasses an area of low, rocky hills and ridges, and rock outcrops with scattered Joshua trees, just east of Rose Valley and southeast of South Haiwee Reservoir. The landscape is generally composed of complex desert landforms consisting of low, rocky hills and ridges with prominent rock outcrops and boulder piles. Vegetation includes grass and low-growing shrubs of subdued yellows, greens and tans with scattered Joshua trees. The unit landscape imparts a sense of remoteness that, along with the coherent assemblage of high desert features, enhances visual interest and scenic quality.

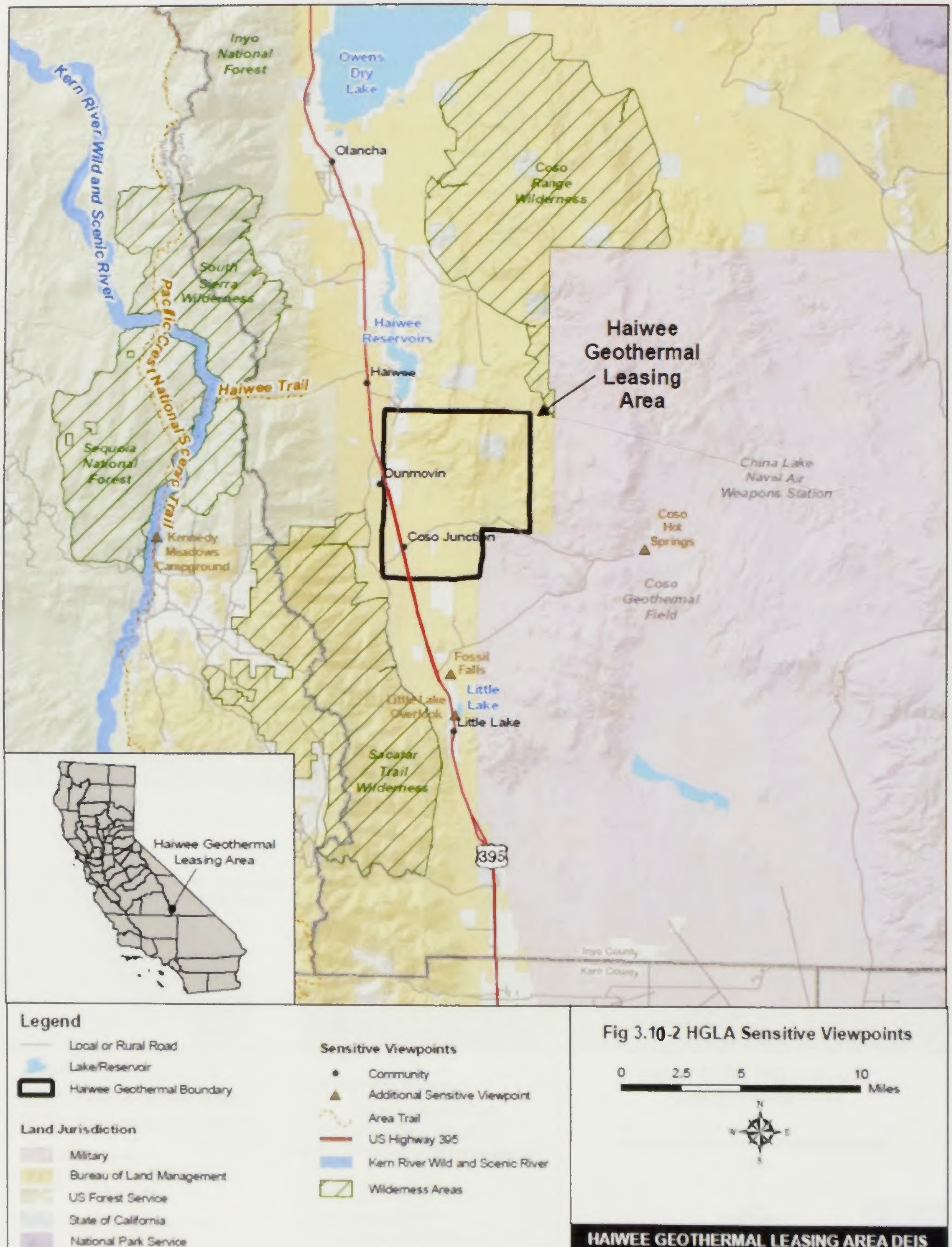
SQRU 04

Located just east of Rose Valley and southeast of South Haiwee Reservoir. This unit encompasses the southern portion of McCloud Flat, several north-south trending ridges and the southern portion of another small, isolated valley to the immediate west of McCloud Flat. The landscape is dominated by the shallow, confined valleys/flats, rocky hills and ridges, and prominent rock outcrops and is accessible only by off-highway vehicles. The landscape is generally composed of complex desert landforms of grass and low-growing shrubs in subdued yellows, tans, browns and greens, punctuated by numerous Joshua trees. The landscape exhibits a high level of scenic integrity with minimal evidence of cultural modification. The natural landscape offers features of substantial visual interest and scenic quality, and imparts a sense of remoteness.

Sensitive Viewpoints

Sensitive viewpoints are shown on Figure 3.10-2 and their corresponding visual sensitivity levels are listed on Table 3.10-2.

Figure 3.10-2 HGLA Sensitive View Points



Visibility and Distance Zones

Visibility of the HGLA from sensitive viewpoints was inventoried through a review of mapping of viewpoint locations and topographical mapping. Viewpoint locations were studied using aerial imagery from Google Earth to determine the extent of potential visual screening by topography. Views are described in the general terms of open, partially screened, or screened views.

Communities

Olancha

Olancha is located over 10 miles north of the HGLA, north of North Haiwee Reservoir. Background views of the HGLA including SQRUs 01 and 04 may occur from the community. Because of the considerable distance between Olancha and the HGLA, views of the higher elevation areas of SQRUs 01 and 04 would generally be open while views of the lower elevation areas may be partially screened by topography or built elements in the landscape.

Haiwee

Haiwee is located over five miles north of the HGLA, west of the North Haiwee Reservoir. Open background views of the HGLA including SQRUs 01 and 04 may occur from the community. Because of the considerable distance between Olancha and the HGLA, the higher elevation areas of SQRUs 01 and 04 would be much more visible than the low elevation areas.

Dunmovin

Dunmovin is located to the west of the HGLA. The community would have expansive, open views across SQRU 01. Views would extend across SQRUs 02, 03, and 04, extending up the southwest slopes of the low, rocky hills and ridges that make up SQRUs 03 and 04. Views of the northeast portions of these rating units would generally be blocked by topography. All potential views of the HGLA would occur in the foreground/middleground distance zone.

Coso Junction

Coso Junction is located within SQRU 01. The community would have expansive, open views across SQRU 01. Views would extend into SQRUs 02, 03, and 04, extending up the southwest slopes of the low, rocky hills and ridges that make up SQRUs 03 and 04. Potential views of the northeast portions of these rating units would generally be screened by topography. All potential views of the HGLA would occur in the foreground/middleground distance zone.

Little Lake

Little Lake is located over five miles from the south edge of the HGLA. This area would have open background views of the rocky hills and ridges of SQRUs 03 and 04. Potential views of SQRUs 01 and 02 would generally be screened by topography.

Travel Corridors

U.S. Highway 395

The portion of US 395 within and near the HGLA is a state identified eligible scenic highway. It is not currently designated as a scenic highway but may be in the future. The highway crosses through the southeast portion of the HGLA within SQRU 01. The highway is in generally flat terrain and would have expansive, open views across SQRU 01. Views would extend into SQRUs 02, 03, and 04, extending up the southwest slopes of the low, rocky hills and ridges that make up SQRUs 03 and 04. Views of the northeast portions of these rating units would generally be screened by topography. All potential views of the HGLA would occur in the foreground/middleground distance zone.

Recreation and Preservation Viewpoints

Little Lake Overlook

Little Lake Overlook is located over five miles south of the HGLA. The site provides views down onto Little Lake, which is one of the few remaining quality wetlands in the vicinity. It is an oasis in the desert. The overlook also offers scenic vistas of Little Lake and the Sierra Nevada Mountains. Due to the location of the overlook on a ridge above the lake, views are generally oriented out over the lake, to the northwest, west, and southwest. Views to the north are dominated by Red Hill, which is south of the HGLA. Generally open views of the HGLA would occur from the overlook with some screening from topography. All potential views of the HGLA would occur in the background distance zone.

Fossil Falls

Fossil Falls is located south of the HGLA, four miles from the south boundary. Fossil Falls is a ravine in a volcanic rock formation that has been eroded and polished into distinctive formations. Potential views of the southern portion of SQRU 01 would occur at the outer perimeter of the foreground/middleground distance zone. Potential views of the other SQRUs would occur in the background distance zone. Views north from Fossil Falls are generally dominated by Red Hill and may be partially screened by topography. The HGLA would potentially be visible from areas outside the ravine, but would not be visible for recreationists who descend into the ravine.

Sacatar Trail Wilderness

The Sacatar Trail Wilderness is located to the southwest of the HGLA. Potential foreground/middleground views of SQRU 01 would occur from the edge of the wilderness, while more distant views would potentially occur from within the wilderness. Potential views of the other SQRUs would occur in the background distance zone. Access to the wilderness from the east side is generally limited to the Sacatar Trail, thus views would generally be expected to occur from the trail.

Coso Range Wilderness

The Coso Range Wilderness is located to the northeast of the HGLA. Access to the wilderness from the west side is via US 395 and four-wheel drive routes, however motor vehicle use is prohibited within a wilderness area. Foreground/middleground views of SQRUs 03 and 04 would occur from the edge of the wilderness. Additional foreground/middleground views of all the SQRUs would occur from higher elevations within the wilderness where views over the hills and ridges of SQRUs 03 and 04 would occur.

South Sierra Wilderness

The South Sierra Wilderness is located to the west of the HGLA. Potential background views of all SQRUs may occur.

Haiwee Trail

The trailhead is located three miles from the HGLA. Potential foreground/middleground views of SQRUs 01, 03 and 04 would occur from the trailhead and from the trailhead access road. Potential views from the trail would be screened by topography.

Inyo National Forest Background Viewpoints

The Pacific Crest National Scenic Trail, Kennedy Meadows Campground, and the Kern River Wild and Scenic River are all located over seven miles from the HGLA. Potential background views from these viewpoints would be screened by topography.

Coso Hot Springs

Coso Hot Springs is located at the outer perimeter of the foreground/ middleground distance zone for SQRU 02 and in the background distance zone for the other SQRUs. Views of the HGLA would be screened by topography from the site.

Visual Resource Inventory and Visual Resource Management Classes

VRM Classes were not designated in agency management plans for the HGLA at the time this study was conducted. The Visual Resource Inventory study that preceded this report established VRI Classes, which the BLM may establish as interim VRM Classes in this EIS/ROD.

The Visual Resource Inventory studies resulted in the identification of two Visual Resource Inventory classes within the HGLA (Clayton 2009). SQRUs 01 and 02, when combine with the respective viewpoints and visibility, were classified as VRI Class III, while SQRUs 03 and 04 when combined with the respective viewpoints and visibility were classified as VRI Class II. These two classes are adopted as interim VRM classes for the HGLA EIS pending further VRI study. Draft VRM classes are expected to be established in the Desert Renewable Energy Conservation Plan (DRECP) when it is published in 2012.

3.11 LANDS AND REALTY

3.11.1 Applicable Regulations, Plans, Policies/Management Goals

The federal, state, and local land use regulations and management plans potentially applicable to the HGLA are described below.

Federal Land Policy and Management Act (FLPMA) 1976 and Federal Regulations Pertaining to Rights-of- Way

In 1976, Congress passed the FLPMA, Public Law 94-57, 43 U.S.C. §§ 1701–1785, to direct the management of the public lands of the United States. In Section 601 of the FLPMA, Congress required the preparation of the California Desert Conservation Area (CDCA) Plan. It is the purpose of that plan to establish guidance for the management of the public lands of the California Desert by the BLM in clear accordance with the intent of Congress and the people of the United States, as expressed in the law.

Section 601 of the FLPMA requires that the BLM develop a plan to "provide for the immediate and future protection and administration of the public lands in the California Desert within the framework of a program of multiple uses and sustained yield, and the maintenance of environmental quality."

A number of notable resources exist within the CDCA, including important mineral and energy resources. As a result, the CDCA Plan includes mapped areas that may have potential for energy resources, including geothermal resources. The HGLA is primarily located adjacent, or within, the Coso Known Geothermal Resource Area (KGRA).

The FLPMA also establishes the current federal legal framework for the issuance of rights of way (ROW) on public lands as per 43 U.S.C. §§ 1761–1771. Construction, operation, and maintenance of electric facilities would require a BLM ROW grant. A ROW grant is an authorization to use a specific tract of public land for certain projects such as roads, pipelines, transmission lines, and communication sites. A ROW grant authorizes rights and privileges for a specific use of the land for a specific period of time. Generally, a BLM ROW is granted for a term appropriate for the life of a project. Applications for commercial geothermal energy facilities would be processed as ROW authorizations under the FLPMA, Subchapter V (43 U.S.C. §§ 1761 et seq.), and BLM regulations, Title 43 CFR Part 2800.

Pursuant to Title 43 CFR Section 1610.5-3, any ROW granted by the BLM must be consistent with the relevant Resource Management Plan(s). For a project located in the HGLA, the relevant plans are the CDCA Plan and its amendment, the West Mojave Desert (WEMO) Plan, which are discussed below.

Federal Energy Policy Act of 2005

The Federal Energy Policy Act of 2005 includes various initiatives directed at securing the nation's energy future, which include authorizing the United States Department of Energy, in collaboration with federal land management agencies, to designate corridors for energy transmission on federal lands within the 11 contiguous western states. A 1,050 foot wide designated Section 368 Corridor (18-23), runs north-south across the western portion of the HGLA.

California Desert Conservation Area Plan of 1980, as amended

Under the FLPMA, the BLM must manage the lands within its jurisdiction in compliance with a Resource Management Plan. The HGLA (including the three pending lease application sites), is managed pursuant to the CDCA Plan, as amended. The CDCA Plan serves as a guide for the management of all BLM-administered lands in three desert areas: the Mojave Desert, the Sonoran Desert, and a small portion of the Great Basin. The CDCA Plan covers 25 million acres, of which 12 million are public lands. The primary goal of the CDCA Plan is to provide overall maintenance of the land while planning for multiple uses and balancing the needs of people with the protection of the natural environment.

In June 2006, the CDCA was amended by the WEMO Plan. The HGLA is located within the area covered by the WEMO Plan. This plan covers the West Mojave Desert area of 9.3 million acres in Inyo, Kern, Los Angeles, and San Bernardino Counties. Included therein are 3.3 million acres of public lands administered by the BLM, 3.0 million acres of private lands, 102,000 acres administered by the State of California, while the balance consists of military lands administered by the Department of Defense. Within the HGLA the WEMO Plan establishes a conservation area for Mojave ground squirrel to ensure its long-term survival and protection.

The CDCA Plan organizes BLM-managed lands into one of five multiple-use classes: Controlled Use (C), Limited Use (L), Moderate Use (M), and Intensive Use (I). A fifth category of land, "Unclassified", is for parcels that have not been classified and will be studied to determine what class they appropriately belong in. The HGLA is located on the BLM's Multiple Use Class (MUC) "Class L". MUC Class L lands protect sensitive, natural, scenic, ecological, and cultural resource values. Lands within the CDCA, including the WEMO area that is designated as MUC Class L are "managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished." However, it is important to note that, for MUC Class L lands, geothermal electrical generation facilities may be allowed pursuant to licenses issued under 43 CFR Section 3250, et seq., as long as all applicable NEPA requirements are met.

Nearly the entire range of the Mojave ground squirrel, a state-listed threatened species, lies within the West Mojave planning area, and most of this land is public land managed by the BLM. A total of 1,726,712 acres is included within the MGSCA. Public lands within the MGSCA are designated as a BLM Wildlife Habitat Management Area in the CDCA Plan. Within the MGSCA, the public lands south of Owens Lake are designated as MUC Class L. As further discussed in Section 3.7, Biological Resources, development is only allowed within one percent of public lands in the MGSCA consistent with the applicable WEMO Plan restrictions; according to the BLM, a total of 10,387 acres are available for development within this area (BLM 2009b, personal communication).

The CDCA Plan designated sixteen (16) major Energy Production and Utility Corridors. These corridors are available to consolidate compatible ROW, avoid sensitive resources wherever possible, complete the delivery-systems network, site ongoing projects for which decisions have been made, and for ROW networks for power needs and alternative fuel resources. The CDCA Plan also allows for the designation of corridors that address the following types of utility facilities: New electrical transmission towers and cables of 161 kV or above; all pipelines with diameters greater than 12 inches and coaxial cables for interstate communications; and major aqueducts or canals for inter-basin transfers. The plan calls for these corridors to be designed to provide a two mile standard for separation of existing facilities, and to accommodate flexibility in the selection of alternative routes for ROW.

In 1984, the CDCA Plan was amended to establish a one mile wide, five mile long corridor to connect the Coso KGRA with designated Utility Corridor A (CDCA Plan, Map 16), which runs north and south along existing power lines on the east side and adjacent to US 395. A 115 kV transmission line and a buried telephone cable line ROW (BLM California Serial Numbers CACA 13510 and CACA 18885) primarily follow the amended corridor. This

ROW was previously authorized to the California Energy Company, and then subsequently assigned to Coso Power Developers, Coso Finance Partners, and Coso Energy Developers.

The CDCA Plan also includes a geology-energy-mineral (G-E-M) resource element, which defines the following goals for G-E-M resources:

- 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, G-E-M database, and professional, technical, and managerial staff knowledgeable in mineral exploration and development.

Specific objectives of the G-E-M element are:

- To 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 United States imports 50 percent or more, and minerals of which the United States is a net exporter.
- To 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.

Applicable State Regulations

California State Planning and Zoning Law

The California Government Code Sections 65352, 65940, and 65944, also referred to, in part, as the State Planning and Zoning Law, includes the provisions of Senate Bill (SB) 1462, adopted in 2004, that require the military to be notified of any land use proposal located within 1,000 feet of a military installation, within special use airspace, or beneath a low level flight path. To aid in the implementation of SB 1462, the California Office of Planning and Research has drafted the R-2508 Joint Land Use Study to address land use issues for the R-2508 military range complex (R-2508 Complex). A Joint Land Use Study is a collaborative planning effort between active military installations, surrounding counties and cities, and other affected agencies. The R-2508 represents the largest block of restricted airspace in the United States. This 20,000 square-mile range complex encompasses large portions of Inyo, Kern, San Bernardino, and Tulare Counties, and includes Edwards Air Force Base, China Lake NAWS, and the Army's Fort Irwin National Training Center.

The eastern portion of the HGLA is located within restricted area R-2505, a designated sub-area within R-2508; as such, it is considered "special use airspace". This designation requires that an evaluation of land use compatibility be conducted pursuant to sections 65352, 65940, and 65944 of the California Government Code which include the provision for consultation among the project applicant, public agencies, and the affected military branch. The Joint Land Use Study for the R-2508 complex was published May 2008, and contains a number of policies affecting land use decisions for projects within the R-2508 complex. Specifically, the R-2508 Joint Land Use Study promotes compatible land development in areas subject to aircraft noise and accident potential by providing compatible use guidelines for land areas surrounding the installation.

The R-2508 Joint Land Use Study recommends that the BLM refer specific BLM development applications to the appropriate military installation for review, and to ensure early notification of such military installations and local communities when the initial application is revised.

California State Lands Commission

A section of "school land" is located at Township 21 South, Range 38E, Section 16 within the HGLA. School lands fall under the jurisdiction of the California State Lands Commission (CSLC). 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.

Applicable Local Regulations

Inyo County

Lands under private ownership exist within and adjacent to the HGLA. Applicable management plans and policies for these lands include the Inyo County General Plan (Inyo County 2001) and Inyo County zoning regulations. Geothermal energy development is addressed in two of the Plan's elements, Government Element[3] and Conservation/Open Space Element. The County's land jurisdiction also includes private projects on federal lands. *Inyo County Code Chapter* 19 *(Geothermal Resource Development)* regulates geothermal resource development, including exploratory wells and production projects, through a Conditional Use Permit (CUP) process and includes detailed standards regarding setbacks, noise, site restoration, etc. *Inyo County Code Section* 18.77 *(Water Transfers)* regulates

[3] The County is updating its General Plan Government Element, the draft of which includes goals and policies related to renewable energy development. The draft updated Element includes, amongst others, goals to support renewable energy development and consider, account for, and mitigate ecological, cultural, economic, and social impacts, as well as benefits, from development of such resources.

water transfers between basins in the County, as well as out of the County, through a CUP process. It also requires findings that the water transfer will not unreasonably affect the overall environment or economy of the County. The County would also assess increased property valuation due to improvements that may result from leases.

Air Installation Compatible Use Zones

The purpose of the Air Installation Compatible Use Zone (AICUZ) Program (Title 32 Part 256) is to protect the public health, safety and welfare from noise and aviation hazards through compatible development in an airport environment. The Program was instituted by the Department of Defense in 1973 to address land development surrounding military air installations, and to identify and develop a plan for land areas whose development could be significantly influenced by the operation of an airfield. As such, the AICUZ program is used to assist local communities in their future planning and zoning activities. The program addresses safety concerns within the approach and departure corridors from an airfield. The China Lake AICUZ study was approved in 1977, and an updated interim China Lake AICUZ study was released in 2007.

The China Lake NAWS maintains operational flight capabilities at Armitage Airfield. The China Lake AICUZ study analyzed baseline and prospective flight operations, and evaluated the noise and safety considerations associated with those operations. Based on this analysis, an "AICUZ footprint" and a "Military Influence Area" were created for Armitage Airfield, and the land use compatibility within these areas was evaluated. The AICUZ Program also identified Accident Potential Zones, which are areas where potential aircraft-related hazards are most likely to occur. In addition, the AICUZ study addressed lighting issues (direct or reflected) that could impair pilot vision; towers, other tall structures, and vegetation that either penetrate navigable airspace or are planned for construction near the airfield; land uses that would generate smoke, steam, or dust; land management that would attract birds, especially waterfowl; and electromagnetic interference with aircraft communications, navigation, or other electrical systems.

The HGLA does not fall into the China Lake NAWS' Accident Potential Zone, AICUZ footprint, or MIA.

3.11.2 Affected Environment

The region surrounding the HGLA is sparsely settled. A number of small, unincorporated communities lie primarily along the US 395 corridor. There are only two incorporated cities in the general vicinity of the HGLA, Ridgecrest and California City, both located in Kern County to the south. Independence, the seat of Inyo County, is located 50 miles to the north of the HGLA. Other small, unincorporated communities in the vicinity include Haiwee, Olancha, Dunmovin, and Little Lake. The small community of Coso Junction is located within the HGLA. Other land uses in the vicinity of the HGLA include the China Lake NAWS located to the east, North and South Haiwee reservoirs to the northwest, Little Lake Ranch to the south, and the existing Coso Geothermal Area to the southeast.

The China Lake NAWS facility covers 1.1 million acres of land, and was established in 1943 with the mission of supporting research, development, testing, and evaluation of weapons, as well as to provide primary training in the use of these weapons. The China Lake NAWS consists of two major land areas: the North Range, encompassing 950 square miles (606,926 acres), and the South Range, encompassing 760 square miles (503,510 acres). The installation currently conducts research, development, testing, and evaluation of weapons.

Although the nearby eastern Sierra Nevada, Inyo National Forest, and three designated wilderness areas provide numerous recreational opportunities, recreational use of the HGLA is more limited. National Forest System lands or designated wilderness areas are not located on or adjacent to the HGLA.

US 395, a primarily north to south trending highway that provides the principal access to the action area, traverses the Rose Valley and crosses the southwestern portion of the HGLA. The highway is a major arterial, heavily utilized for travel between Southern California, the mountain recreation areas, and northern Nevada. The remaining road network consists of a few secondary roads and numerous unpaved cross-country routes. The HGLA is generally comprised of undeveloped desert with naturally-vegetated areas.

3.11.2.1 Land Status and Jurisdiction

Lands within the HGLA are composed of federal, state, and private lands encompassing 38 sections, or 24,320 acres. The BLM public lands within the HGLA fall under the jurisdiction of the BLM's Ridgecrest Field Office in Ridgecrest, California. The HGLA encompasses 22,460 acres of BLM-managed public lands as well as three pending lease applications covering 4,460 acres. The BLM-managed lands considered for leasing are located in the Mount Diablo Meridian, and generally occupy all or portions of the following 37 sections (see Appendix I):

Township 21 South, Range 37 East, Sections 11-14, 23-26, 35-36
Township 21 South, Range 38 East, Sections 7-10, 15, 17-22, 27-34
Township 22 South, Range 37 East, Sections 1-2, 11-12
Township 22 South, Range 38 East, Sections 5-8

The three pending noncompetitive lease applications (CACA 43993, CACA 43998 and CACA 44082) total 4,460 acres, and are generally located on all or portions of the following eight sections:

CACA 43993 - Township 21 South, Range 37 East, Sections 13, 23 S 1/2, 24, 25, 26 E 1/2 of E ½

CACA 43998 - Township 21 South, Range 37 East, Sections 11-12

CACA 44082 - Township 21 South, Range 37 East, Section 14

The remainder of the HGLA consists of lands owned by the State of California, and private lands. State School Land managed by the California State Lands Commission (CSLC) (Section 16) is situated in the northeast portion of the HGLA. Other state-owned lands include those under the jurisdiction of Caltrans along US 395. Privately-owned lands generally occur along or near the US 395 corridor.

3.11.2.2 Land Use Authorizations

Land use authorizations include various authorizations and agreements to use BLM-administered land such as ROW grants, road use agreements, and associated temporary use permits. Land use authorizations are issued for a variety of uses, both short and long term. Short-term uses include agricultural leases, military training areas, and other uses involving minimal land improvements or disturbances. Long-term uses include ROW grants for power lines, highways, roads, pipelines, fiber optic cables, communication and electric power generation sites, and irrigation.

As previously discussed, US 395 is a major north-south route that traces the eastern slope of the Sierra Nevada, and traverses the southwestern portion of the HGLA. Much of US 395 in Inyo County is a two lane highway, but increasing traffic demands have resulted in expansion of US 395 to four lanes to the north and south of the HGLA. Other facilities in the area include the Los Angeles Aqueducts located to the west of the HGLA.

One major utility ROW presently traverses a portion of the HGLA. This corridor runs in a northwest to southeast direction in the vicinity of US 395. This corridor currently contains two LADWP transmission lines (500 kV DC and 230 kV), one Southern California Edison (SCE) 138 kV transmission line, and buried fiber optic networks and telephone lines.

Finally, a 1,050 foot wide Section 368 Designated Energy Corridor (18-23), authorized under the Federal Agency Policy Act of 2005, runs north-south across the western portion of the HGLA.

Table 3.11-1 Current Land Use Authorizations within the HGLA.

Holder	Serial #	Description
Coso Energy Developers	CACA 13510	Power Transmission Line – 50 ft
Coso Energy Developers	CACA 18885	Telephone Line – 10 ft
Southern California Edison	CACA 21596	115 kV Power Transmission Line – 80 ft
Southern California Edison	CACA 26242	12 kV Power Transmission Line – 10 ft
Verizon California LLC	CACA 26398	Fiber Optic Line – 10 ft
Little Lake Renewables LL	CACA 45386	Wind Energy Facility – Pending
Coso Operating Co.	CACA 46289	Pipeline
Deep Rose, LLC	CACA 47464	Water Pipeline
Maxx Management Corp	CACA 43998	Pending Geothermal Lease
Maxx Management Corp	CACA 44082	Pending Geothermal Lease
Terry K Metcalf	CACA 43993	Pending Geothermal Lease
CA Dept of Public Works	CALA 0 88333	Material Sites
LADWP	CALA 0 88876	500 kV Power Transmission Line – 250 ft
CA Dept of Public Works	CALA 0 93471	Federal Highway
Verizon California Inc.	CALA 0 125334	Fiber Optic Line – Variable Widths
City of Los Angeles	CALA 0 155168	34.5 kV Power Transmission Line – 50 ft
CA Dept of Public Works	CALA 0 164238	Material Site
LADWP	CARI 231	Aqueduct – 100 ft
CA Dept of Public Works	CARI 2641	Federal Highway
Southern California Edison	CARI 2861	12 kV Power Transmission Line – 25 ft
Southern California Edison	CARI 4354	12 kV Power Transmission Line – 25 ft

3.12 PUBLIC HEALTH AND SAFETY

3.12.1 Applicable Regulations, Plans, Policies/Management Goals

The CDCA Plan does not set out specific goals for human health and safety, or management of hazardous materials. However, the BLM's stated policy is to reduce threats to public health, safety, and property. In addition, in accordance with the FLPMA, the 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 and permitted.

3.12.2 Affected Environment

3.12.2.1 Public Health

California has a considerable mining history and a legacy of abandoned mines. According to the National Mine Land Inventory, found on the BLM's Geocommunicator site, scattered abandoned or inactive mine openings currently exist in the HGLA. To inform the public about the potential safety hazards of abandoned and inactive mines, the BLM has produced several informational brochures about National Abandoned Mine Lands Strategic Plan, Instruction Memoranda, and Technical Resources. Precautions should be utilized around such sites. Abandoned mine hazards include open shafts and adits, open pits and quarries, high and steep walls of pits and trenches, potential presence of explosives, presence of contaminated air or gas in underground shafts, and the presence of unstable buildings or structures.

The South Haiwee Dam (CA DWR dam number 6-024), a hydraulic fill dam, could pose a hazard in the event of catastrophic failure of the dam. The County of Kern in its hazardous response plan lists Haiwee Reservoir (in Inyo County) as a flood hazard to the Kern County communities south of the HGLA. Thus, a dam breach may be a hazard to any potential geothermal development. An additional hazard would be inundation by water transporting arsenic-enriched sentiments across the surface of Rose Valley. The sediments could dry on the valley floor and become wind-borne and blow in the direction of Ridgecrest. Built in 1913, South Haiwee Dam was damaged in a 1952 earthquake and improvements were made subsequently. (see http://www.michigan.gov/documents/deq/deq-p2ca-caseismicpaper_281049_7.pdf) .

3.12.2.2 Hazardous Materials

The term "hazardous materials" issued by the State of California to identify a variety of substances that pose a health and safety risk to the environment, humans, vegetation and wildlife. Hazardous materials within the HGLA may consist of materials in informal dumping sites and mining-related hazardous materials. Landfills of all kinds have the potential to cause adverse environmental impacts to BLM-administered land. Chemical leachate from landfills has the potential to contaminate soil and reach surface water or groundwater. Local law enforcement is responsible for enforcing laws and regulations that prohibit illegal dumping in landfills on lands that are not managed by the BLM. The closest known landfill to the HGLA is the Lone Pine Landfill, located 32.3 miles to the north of the HGLA. The Lone Pine Landfill, a permitted solid waste disposal facility, was established in 1965 to serve the disposal needs of the residents of Lone Pine, California, and the surrounding area. The State of California defines the landfill as a Class III disposal site, accepting only non-hazardous municipal solid waste generated within its local service area. Additionally, the State Water Quality Control Board is beginning to investigate other human infrastructure that may be exacerbating impacts of naturally occurring water-borne contaminants. Haiwee Reservoir, for example, may be creating unnatural conditions that promote the mobility of naturally occurring arsenic. In the recent past, LA Department of Power and Water has deposited arsenic-rich sediments into Haiwee Reservoir directly north of the HGLA.

Hazardous mining waste consists of mineralized waste rock, ore stockpiles, and mill tailings. Metallic minerals that occur in the rock have the potential to contaminate soil and water down gradient of the mining waste. Mill tailings may contain traces of metals as well as other chemical constituents, such as acids. Mine workings and mine dumps containing sulfide mineralization can also create acid mine drainage when exposed to oxygen and water. The California Department of Conservation abandoned mine database lists 11 abandoned mine features in the HGLA area, 4 as depicted in Map 3.11.1.This type of hazardous material may occur at abandoned mines on and adjacent to BLM-administered land; however the lack of water in the area eliminates, or minimizes the potential for acid mine drainage problems.

Although firing ranges or impact areas are not known within the HGLA, there is a low potential for unexploded ordnance on public lands as a result of years of nearby military operations. No known occurrences have been documented.

In summary, no detailed surveys of potential hazardous or solid waste sites have been undertaken within the HGLA although hazards are immediately present just outside the HGLA. The BLM maintains no records of reportable spills in this area. Although use of motorized vehicles and other equipment by the public may have resulted in periodic and scattered spills or releases of fuel and petroleum products, no such events have been documented.

3.13 ENERGY AND MINERAL RESOURCES

3.13.1 Applicable Regulations, Plans, Policies/Management Goals

Mineral resources on federal lands are governed by the General Mining Law of 1872, as amended; those portions of the FLPMA of 1976, as amended, that affect the General Mining Law; the Surface Resources Act of 1955, and the Mining and Minerals Policy Act of 1970. Oil and gas leasing on federal lands is guided by the Energy Policy Act of 2005. Geothermal leasing is guided by the Geothermal Steam Act of 1970 (30 USC 1001 et. seq.), as amended by the Energy Policy Act of 2005.

The BLM manages oil and gas leases under Title 43, CFR Part 3100, and exploration for these resources under Part 3150. Geothermal leasing is managed under Part 3200, mineral materials under Part 3600, mining claims for locatable minerals under Part 3800, and solid leasable minerals other than coal or oil shale under Part 3500 regulations.

The most applicable management goal of the CDCA Plan addresses the G-E-M resources as follows:

(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.

3.13.2 Affected Environment

3.13.2.1 Renewable Energy Resources

Renewable energy includes solar power, wind, biomass, hydropower, and geothermal resources. These resources all have different requirements related to economic development. However, some issues are common to all, including distance to existing electric transmission facilities, and compatibility with existing federal land uses. As demand for clean and viable energy to power the nation has increased, consideration of renewable energy sources available on public lands has come to the forefront of land management planning.

The National Renewable Energy Laboratory (NREL), an agency of the Department of Energy, has developed a Renewable Resource Assessment Project. The findings of this project are contained in a 2003 report entitled *Assessing the Potential for Renewable Energy on Public Lands*. This report identified criteria that are considered in establishing potentials for various types of renewable energy. It also summarizes these potentials, and identifies the top 25 BLM Planning Areas with the highest potentials for various classes of renewable energy development. The Ridgecrest Planning Area was included in the top 25 planning units with the highest potential for solar (photovoltaics), wind, and geothermal resources.

Areas such as Coso and Randsburg have both been identified by geothermal personnel from the BLM state office as California "top-pick" sites having the highest potential for geothermal resource development. The majority of the HGLA lies within the federally designated Coso KGRA. This KGRA contains the Coso Geothermal Project, a commercially developed geothermal field currently producing over 200 megawatts (MW) of electricity.

Currently, there are no solar energy sites on BLM-administered lands within the HGLA. However, demand for renewable energy development is expected to increase, and management actions may be necessary to provide for additional future renewable energy growth in the HGLA while protecting its sensitive resource values.

There are no permanent wind energy facilities on BLM-administered lands within the HGLA. Two wind energy ROW applications have been submitted to the BLM (CACA 45386, issued to Little Lake South Renewables, RES America Developments, Inc., and CACA 50170, issued to Debenham Energy) fall within the HGLA. Application CACA 50170 has since been withdrawn and the file is now closed. If authorized, the ROW grant for the Little Lake South Renewables, LLC – Little Lake North Project (CACA 45386), would only allow for site testing and wind energy monitoring (i.e., installation of met towers). This authorization would not give the ROW grant holders the development rights; development would still require the submittal of a separate application to the BLM for review, analysis, and separate approval. Future applications for testing and/or development would be processed in accordance with the policies and best management practices established by the *Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM Administered Lands in the Western United States* (2005). The pending ROW application is generally located in the western half of the HGLA, and includes 8,835 acres (CACA 45386). (See Figure 2.1-1)

Two other geothermal-related projects (Deep Rose Geothermal Exploration Project and Coso Hay Ranch Water Extraction and Delivery System) have been proposed within the HGLA. Deep Rose, LLC (Deep Rose) of Ridgecrest, California, has proposed the construction of a well pad, access road, water line, support facilities (i.e. truck turnout areas and water storage areas), and the drilling and testing of up to four geothermal exploratory wells within the HGLA. The proposed well pad is located on land owned by the State of California, and managed by the CSLC. After the initial well, subsequent wells may or may not be drilled based on the subsurface geological investigations. The area to be explored is located near southern McCloud Flat, within Township 21 South, Range 38 East, Section 16. The access road, water line, and support facilities are located on public land administered by the BLM.

Deep Rose has submitted to the California Department of Conservation Division of Oil, Gas, and Geothermal Resources (DOGGR) a Notice of Intent (NOI) to Drill and an application for a Geothermal Resources Prospecting Permit to the CSLC. The CSLC may issue such permits under the authority of the State Geothermal Resources Act of 1967, as amended in 1978.

The Coso Operating Company, on behalf of Coso Hay Ranch LLC ("Coso"), completed the Coso Hay Ranch Water Extraction and Delivery System project in early 2010. This project encompasses a nine mile long corridor with a 50-foot ROW, encompassing approximately 54 acres. This ROW includes 5.63 acres of private land included within the Coso Hay Ranch, 32.24 acres on public lands managed by the BLM, and 16.18 acres within the China Lake NAWS. The Coso Hay Ranch project affects the following BLM lands: Township 21 South, Range 37 East, Sections 35-36 and Township 21 South, Range 38 East, Sections 31-34.

Two existing wells at Coso Hay Ranch (the North Well and South Well) are the source of the augmentation water for the Coso geothermal facilities. A 12-inch pipeline, extending from the North Well past the South Well to a pump station located adjacent to the South Well, is located entirely on the Hay Ranch. A 250,000-gallon collection tank, surrounded by a perimeter chain link fence, is located at the pump station. From this collection tank, a 20-inch pipeline has been installed along an existing access road leading to the injection site (Well 88-1) located on the Coso property.

Power for the Coso Hay Ranch Water Extraction and Delivery System project is provided by a new substation constructed by SCE at a location immediately adjacent to the project pumping equipment. The new substation is tied into SCE's existing transmission line which runs past Hay Ranch using an overhead connection. The SCE substation is unmanned, and located entirely within the Hay Ranch property.

3.13.2.2 Energy Minerals

Oil, Gas, and Geothermal

The BLM considers geothermal resources to be a fluid mineral resource along with oil and natural gas. Therefore, while land closures or restrictions to fluid leasable minerals are primarily meant for oil and gas exploration and development, they apply to geothermal exploration and development as well.

Oil and gas drilling and development share other aspects with geothermal resources. Much of the data on geothermal resources comes from oil and gas well drilling. Also, Using oil and gas infrastructure is under consideration to enhance geothermal resources and vice versa (Western Governors' Association 2006).

Non-Energy Minerals

Mining activities in Inyo County extract common minerals such as sand, gravel, clay, borates, pumice, and perlite. Public agencies, such as Caltrans and Inyo County, are the largest users of these minerals. The related employment contributes both to the county's economy and to local infrastructure. Future mineral price fluctuations and international political events will likely continue to affect the extent of the mining industry in Inyo County.

California Lightweight Pumice, Inc. has its existing Makayla Pumice Mine operating within and adjacent to the HGLA. The BLM disposes the pumice through mineral material sales contracts over 130 acres. This area includes portions of public land within Township 21 South, Range 38 East, Section 14, S 1/2 of SE 1/4, Section 21, approximate center (the Makayla pit, 60 acres), Section 23, N 1/2 of NE 1/4, and Section 35, S 1/2 of NE 1/4. Sampling and exploration for pumice has also been authorized in Township 21 South, Range 38 East, portions of Sections 15 and 21.

Other active mines in the area include the TXI Olancha Pumice Mine east of Haiwee Reservoir on private land, and LADWP quarry sites for stone immediately south of Haiwee Dam. A number of inactive and abandoned mineral mines are also scattered throughout the HGLA (including pumice and molybdenum) and the surrounding region.

There are 23 active mining claims recorded with the BLM within the HGLA (Table 3.14-1). An authorized material site (CACA 41832) on BLM public land (Township 21 South, Range 37 East, Section 36, SW 1/4 of SW 1/4) is situated in the HGLA. The site's products serve for maintaining US 395 along Inyo County's front range near Coso Junction. The material site is owned and operated by the California Department of Transportation.

Table 3.13-1 Active Recorded Mining Claims within the HGLA – BLM

Claim Name	Type	Date Recorded	Date of Location	Date of Latest Assessment	Serial # (Full)
MAKAYLA PUMICE NO 1	PLACER	08/21/2000	06/26/2000	8/17/2009	CAMC277668
MAKAYLA PUMICE NO 2	PLACER	08/21/2000	06/26/2000	8/17/2009	CAMC277669
MARGIE 1	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277670
MARGIE 2	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277671
MARGIE 5	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277674
MARGIE 6	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277675
MORIAH 1	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277682
MORIAH 2	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277683
MORIAH 3	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277684
MORIAH 4	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277685
MORIAH 5	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277686
MORIAH 6	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277687
MORIAH 7	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277688
MORIAH 8	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277689
MORIAH 9	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277690
MORIAH 10	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277691
MORIAH 11	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277692
MORIAH 12	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277693
MORIAH 13	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277694
MORIAH 14	PLACER	08/21/2000	06/21/2000	8/27/2009	CAMC277695
DB 197	LODE	11/27/2007	09/08/2007	8/27/2009	CAMC291086
DB 198	LODE	11/27/2007	09/08/2007	8/27/2009	CAMC291087
DB 199	LODE	11/27/2007	09/08/2007	8/27/2009	CAMC291088

Source: BLM, http://www.geocommunicator.gov/blmMap/Map.jsp?MAP=LAND, Accessed on November 3, 2009.

3.14 WILD HORSES AND BURROS

3.14.1 Applicable Regulations, Plans, Policies/Management Goals

Management of wild, free-roaming horses and burros on federal lands was authorized by Congress on December 15, 1971, by the Wild Horse and Burros Act (PL 92-195; 16 U.S.C. 1331-1340) (Act), as amended, by the FLPMA of 1976 (PL 94-579) and the Public Rangelands Improvement Act of 1978 (PL 95-514). The regulations found at 43 CFR Part 4700 and Part 4700 of the BLM Manual prescribe the authorities, objectives, and policies that guide the protection, management, control, and disposition of wild free-roaming horses and burros in accordance with the Act. Through the Act, Congress declared, "It is the policy of Congress that wild free-roaming horses and burros shall be protected from capture, branding, harassment, or death; and to accomplish this they are to be considered in the area where presently found, as an integral part of the natural system of the public lands" and are to be managed "in a thriving natural ecological balance". The policy of the BLM is to manage wild horses and burros in a manner that will insure healthy herds for future generations of Americans, and contribute to the diversity of life forms on public lands administered by the BLM. The Act does not apply to lands managed by the Department of Defense or the National Park Service (although such management is not prohibited on those lands).

The areas where wild horses and burros were known to exist in the California Desert District at the time of the passage of the Wild Horse and Burro Act are addressed in the CDCA Plan (1980, as amended; cuff:, Wild Horse and Burro Management Area, Map No. 8). To the extent that wild horses and burros roam outside a Herd Management Area, they are considered a nuisance and can be removed from the non-Herd Management Area areas. It is the policy of the BLM to manage and remove excess and nuisance animals through humane, live capture means and place them in private maintenance through the BLM's Adopt-a-Horse/Burro program. The following three actions have impacted the management for the Herd Management Area in the greater HGLA region:

- The 1981 Amendment 24 to the CDCA plan deleted the Centennial Herd Management Area for burros, because of the conflicts that they were imposing on the China Lake NAWS.

- The 1994 California Desert Protection Act, Public Law 103-433-October 31, 1994, Section 805(g)(4) assigned the Secretary of Navy responsibility for the management of wild horses and burros located on the China Lake NAWS lands. This is 80 percent of the Centennial Herd Management Area where the majority of the horses' home range is located. The remaining 20 percent of the Herd Management Area is on BLM lands.

- The 2005 NAWS/China Lake Wild Horse and Burro Management Plan identified the goals and objectives for these animals residing within the China Lake Naval Air Weapons Station. It identified that it will retain the Herd Management Area for horses at an Appropriate Management Level of 168 animals and would continue to implement the total removal of burros from their Navy administered lands. The Centennial Herd Management Area acreage is 71,353 acres BLM and 247,147 acres Navy.

The CDCA Plan's Wild Horse and Burro Element lists the following applicable goals:

- Provide for the year-long food requirements of wild horses and burros by reserving sufficient forage to meet the biological requirements of a specified number of animals.

- Provide adequate cover for wild horses and burros by maintaining free access to existing cover for these animals. Attainment of this objective would be consistent with the need to restrict wild horse and burro use from selected riparian areas, when required to protect other resource values.

- Provide adequate water to meet the year-long requirements of wild horses and burros by improving existing waters, developing new waters, and developing alternative waters when wild horses and burros must be excluded from an existing water.

- Provide adequate living space for wild horses and burros by designing new structures or modifying existing structures in such a manner as to allow for the normal distribution and movement patterns of these animals. The key to attainment of this objective is preservation of the home ranges established by a majority of wild horses and burros by use of individual Herd Management Areas. Attainment of this objective would be consistent with the need to restrict wild horse and burro access in selected areas in order to protect other resource values, and specifically to manage burros so that they do not jeopardize the continued existence and welfare of bighorn sheep.

- Protect wild horses and burros on public lands by conducting surveillance to prevent unauthorized removal or undue harassment of the animals.

3.14.2 Affected Environment

Portions of the Centennial Herd Area and the Herd Management Area are located within the HGLA. The CDCA Plan identifies the Centennial Herd Area and Herd Management Area, and establishes the appropriate management level for 168 wild horses and 1,137 burros.

A 2008 aerial census counted 254 horses. The aerial survey showed that 95 percent of the horses occurred within the Navy administered lands, with the majority found on the western half of the Herd Management Area.

The aerial census data also indicated there are 55-60 head of horses utilizing lands along the boundary of the Navy and BLM lands which would have the potential to be within the existing Lacy-Cactus-McCloud (L-C-M) Allotment any time throughout the year. No burros were sighted in the proximity of the L-C-M Allotment. The level of use by the wild horse population within the current L-C-M Allotment is very low. It is suspected the lack of water and past drought conditions in the area has not been conducive for the wild horses to inhabit this area.

3.15 GRAZING

3.15.1 Applicable Regulations, Plans, Policies/Management Goals

Rangeland management on BLM lands is carried out under a number of laws and regulations. The primary management authority is the Taylor Grazing Act (TGA) of 1934, as amended and supplemented. Additional laws includes the FLPMA of 1976 and the Public Rangelands Improvement Act of 1978. The regulations in 43 CFR 4100 address grazing administration. Among the important provisions of the regulations is the requirement to provide a two year notification when public lands within a grazing allotment are devoted to a public purpose which precludes livestock grazing (43 CFR 4110.4-2 (b)). Under these provisions, a permittee cannot lose any of their grazing preference for two years from the "date of notification" that lands in the allotment would be dedicated to another uses. The permittee may waive the two year notification if they choose.

The CDCA Plan Classifies the project area as suitable for continued grazing and provides a number of stipulations to manage livestock grazing.

3.15.2 Affected Environment

Livestock grazing has occurred for many years in the HGLA. There are currently two separate livestock grazing allotments in the HGLA. These are the 41,852 acre L-C-M and the 51,729 acre Tunawee livestock grazing allotments. Grazing on the L-C-M Allotment has not occurred during the past nine years due to administrative issues and is currently undergoing the grazing permit renewal process. The Tunawee Allotment is classified as suitable for both sheep and cattle grazing. Sheep have grazed the allotment regularly over the last ten years. Rangeland health inventories found that both allotments met Rangeland Health standards

3.16 RECREATION

3.16.1 Applicable Regulations, Plans, Policies/Management Goals

The CDCA Plan's Recreation Element lists the following goals:

- Provide a wide range of opportunities within resource capabilities for engaging in recreational activities for all desert users.

- Provide recreational management and facilities consistent with sound visitor and resource protection practices, with emphasis on conserving desert resources that have special scenic, historic, scientific, or recreational values.

- Protect desert users and minimize conflicts among recreationists and users of other desert resources.

- Enhance the enjoyment of the recreation experience and aid resource protection by increasing understanding and knowledge of the California Desert's resources and uses. Pursue this goal through public involvement in volunteer efforts, interpretation and environmental education programs, community outreach efforts, and other programs.

- Monitor and evaluate visitor use and preferences, and adjust BLM programs to meet changing needs where appropriate.

- Provide for off-road-vehicle recreation use where appropriate in conformance with FLPMA, Section 601, and Executive Orders 11644 and 11989.

3.16.2 Affected Environment

The Rose Valley and Owens Valley provides numerous recreational opportunities. Most of the land is owned and administered by the U.S. Department of Agriculture, Forest Service (USFS), the BLM, and the City of Los Angeles. Although much of the Owens Valley floor is comprised of LADWP land, about 75% of LADWP-owned land in Inyo is also open to the public for daytime recreational uses.

The BLM's Ridgecrest Field Office alone manages nearly 1.9 million acres of public lands in Kern, Inyo, Mono, Los Angeles, and San Bernardino counties. These public lands hosted more than 900,000 visitors in fiscal year 2008, providing a variety of recreation opportunities that include motorized OHV trail riding for all-terrain vehicles and non-motorized activities such as hiking, backpacking, hang gliding, hunting, rock hounding, horseback riding, wildlife viewing, photography, rock climbing and mountain biking.

Recreational opportunities within the Inyo National Forest, located to the west of the HGLA, include similar activities. In addition, two ski resorts offer alpine skiing and snowboarding;

over 100 miles of trails groomed for multiple purpose winter use (snowmobile, skiing, and hiking), and 45 miles of trails groomed for cross-country skiing.

3.16.3 Existing Conditions

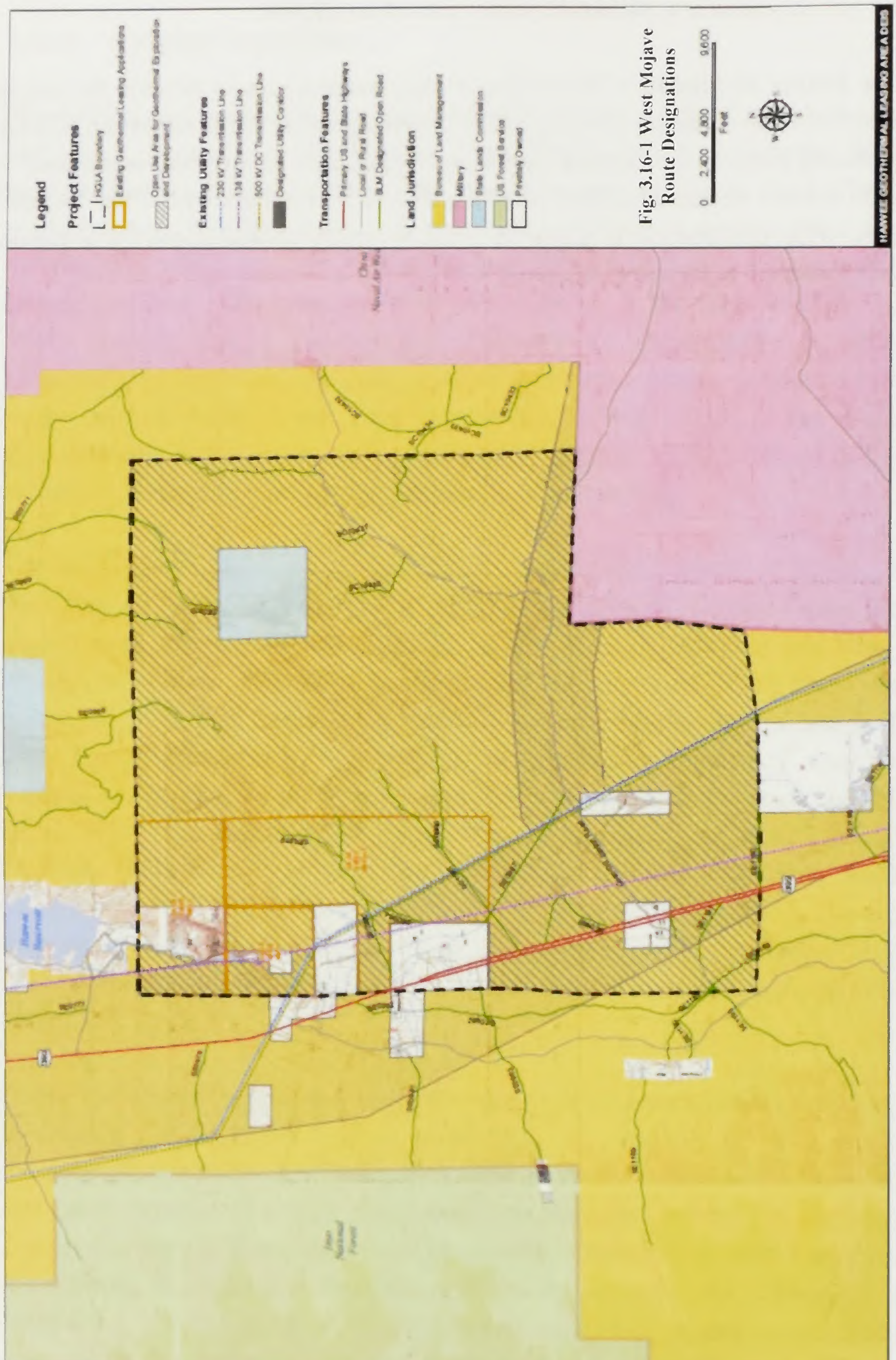
The HGLA and immediate surrounding area support most of the above-listed recreational activities. In addition, the Haiwee Deer Winter Range Watchable Wildlife site offers opportunities to view a portion of the East Monache mule deer herd. The BLM, Kerncrest Audubon, and the Bristlecone Chapter of the California Native Plant Society have also developed a public area on the southeastern side of Little Lake known as the "Little Lake Interpretive Site". This site provides scenic views of the lake, wildlife, wetlands and the Sierra Nevada Range. Interpretive panels provide information on birds, geology, and archaeological history of the area. A variety of native plants, notably wetland species, also occur around Little Lake The surrounding private Little Lake Ranch consists of approximately 1,200 acres, and is managed to provide wildlife habitat and wildlife-oriented recreation, including hunting, fishing, and wildlife viewing.

The BLM limits OHV use in the HGLA to designated routes of travel. Such routes are identified as "open" through the BLM planning process. Closed routes are signed on the ground, and off-road travel is prohibited unless prior approval has been granted by an authorized officer. Presently, motorized-vehicle access on BLM lands within the HGLA occurs on "routes of travel" in accordance with the Multiple-Use Class L. In Multiple-Use Class L, only those routes of travel that are specifically "approved" may be used by motor vehicles. According to the West Mojave Route Designation Program, the following existing BLM routes within the HGLA are designated as "open": SC1043O, SC10431, SC10434, SE1085, SE1189, SE1191, SE1192, SEO771, SEO866, SEO869, SEO870, SEO980, SEO984, SEO979, SEO986, SEO987, and SEO988 (Figure 3.17-1). These routes currently provide for motorized-vehicle access for recreation activities (including OHV use) and other uses such as utility corridors, livestock operations, active mineral extraction/exploration sites, and private lands.

Public lands are allocated as Special Recreation Management Areas (SRMA) or as Extensive Recreation Management Areas (ERMA). A SRMA is a unit where specific recreation/tourism interests have expressed a desire for certain kind of activities, experiences, and other benefits. As such, these units are managed intensively for recreation, and the setting character in these units is a high priority. Areas with a SRMA allocation typically see investments in recreation facilities and visitor services. An ERMA is a unit with no identifiable market demand for structured recreation opportunities. Rather, an ERMA emphasizes the traditional dispersed recreation use of public lands. ERMAs are managed custodially; resources committed are generally limited and include provisions for visitor health and safety, and those aimed at reducing damage and mitigating user conflict. Visitors who want to avoid areas of intensive recreation activities generally prefer ERMAs. By default, anything not allocated as a SRMA becomes part of an ERMA.

A SRMA may be further divided in to Recreation Management Zones to provide for micro-planning in zones that have differing characteristics or management needs within an SRMA. Per the BLM planning process, Recreation Opportunity Spectrum classifications are used to help set recreation themes within management areas. The HGLA occurs within the "Roaded Natural" category. This designation is given to areas typically characterized by a natural environment with moderate evidence of humans.

Figure 3.16-1 West Mojave Route Designation Program Map



The BLM does not have visitation statistics specific to the HGLA; however, the recreational uses and visitation rates to the Ridgecrest SRMA between October 1, 2008 and September 30, 2009 are available, and are summarized in Table 3.17-1. Total estimated visitation (visits and visitor days) between October 1, 2008 and September 30, 2009, for the Ridgecrest SRMA was 235,636 and 140,090, respectively. The most common activities within the Ridgecrest SRMA included driving for pleasure, OHV trail riding, horseback riding, camping, hiking, and mountain bicycling.

Table 3.16-1 Ridgecrest Special Recreation Management Area: Recreational Use and Visitation

Activity	Number of Participants	Visitor
Site: Dispersed-Ridgecrest, ID: 00000.000		
Bicycling - Mountain	4,603	767
Camping	2,638	4,827
Driving for Pleasure	16,397	4,177
Hiking/Walking/Running	6,905	1,151
Horseback Riding	4,806	915
Hunting – Upland Bird	3,452	1,151
Nature Study	3,452	575
OHV - ATV	2,302	575
OHV – Cars/Trucks/SUVs	16,340	2,838
OHV - Motorcycle	6,935	1,155
Photography	3,452	288
Racing – Horse Endurance	272	327
Rockhounding/Mineral Collection	2,302	575
Target Practice	2,302	384
Viewing - Wildlife	2,302	767

Source: BLM 2009.

BLM also manages competitive recreational events, recreation-related commercial enterprises, and other organized events through the use of Special Recreation Permits. Special Recreation Permits are authorizations which allow specified recreational uses of the public lands and related waters. They are issued as a means to manage visitor use, protect natural and cultural resources, and provide a mechanism to accommodate commercial recreational uses. Special Recreation Permits within the HGLA includes permits issued for equestrian endurance rides and dual sport motorcycle tours.

Special Recreation Permits are authorizations which allow specified recreational uses of the public lands and related waters. They are issued as a means to manage visitor use, protect natural and cultural resources, and provide a mechanism to accommodate commercial

recreational uses. Special Recreation Permits within the HGLA include permits issued for equestrian endurance rides and dual sport motorcycle tours.

3.17 SPECIAL DESIGNATIONS

3.17.1 Applicable Regulations, Plans, Policies/Management Goals

Special area designations on public lands can be established by Congress, Presidential Proclamation, or under BLM administrative procedures. The BLM then has the authority to adopt special management designations through RMP amendments or revisions. At its discretion, the BLM may also apply administrative designations in areas requiring special management. Administrative designations are not legislative. Special areas that are designated administratively by the BLM include ACEC, Research Natural Areas, National Natural Landmarks, Backcountry Byways, and Watchable Wildlife Areas. Uses are permitted in the administratively designated areas to the extent that the uses are in harmony with the purpose for which the area was designated.

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 BLM manages designated wilderness consistent with the California Desert Protection Act (CDPA) of 1994, the administrative instruments (regulations, policies, etc.) from that statute, and other applicable federal statutes. These instruments identified management direction for these lands with respect to specific uses that may occur within wilderness, as well as overall goals for lands designated. Of particular importance is the clear Congressional intent that wilderness designations not lead to the creation of "buffer zones" around wilderness boundaries. In and of themselves, non-wilderness activities visible or audible from wilderness are not to be precluded up to such boundaries.

The ACEC designation is an administrative designation unique to the BLM. 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 FLPMA states that the BLM will give priority to the designation and protection of ACECs in the development and revision of land use plans. The ACEC designation indicates to the public that the BLM recognizes that an area has significant values and has established special management measures to protect those values. In addition, an ACEC designation also serves as a reminder that significant value(s) or resource(s) exist that must be accommodated when future management actions and land use proposals are considered within an ACEC or its vicinity. These ACECs differ from other special management designations in that designation by itself does not automatically prohibit or restrict other uses in the area. The one exception is that a mining plan of operation is required for any proposed mining activity within a designated ACEC.

The CDCA Plan does not provide specific management goals or guidelines addressing Special Designation Areas.

3.17.2 Affected Environment

A number of special areas within and near the HGLA have been designated under the above guidelines to protect unique characteristics and contain resources that have been identified as scientifically, educationally, or recreationally important. Such areas include one wilderness area and one ACEC. Special management is administered to these areas with the intent to improve the manageability of the areas, allowing the BLM to preserve, protect, and evaluate these significant components of national heritage.

3.17.3 Existing Conditions

No designated wilderness areas are situated within the HGLA. However, the Coso Range Wilderness Area, administered by the BLM, is located approximately one mile northeast of the HGLA, and comprises 49,294 acres of land designated for camping, hiking, backpacking, and horseback riding. The Coso Range Wilderness encompasses the northern section of the Coso Mountain Range, an area of extensive erosion revealing volcanic displays and numerous valleys and washes. Vermilion Canyon, located in the western side of the wilderness, and Joshua Flat are two especially important areas within this wilderness. The Sacatar Trails Wilderness is also in the vicinity of the HGLA, beginning about a mile to the southwest. It contains about 51,900 acres and spans elevations from about 3,500-8,800 feet above sea level. This wilderness is part of the southern Sierra Nevada Mountains and is on the eastern slope.

One designated ACEC, the Rose Spring ACEC, is located within the HGLA. The designation of the ACEC was made in recognition of important and irreplaceable cultural resources, and the need to protect those resources. The Rose Spring ACEC, designated by the CDCA Plan, consists of 859 acres. A management plan was prepared in 1985. It recommended closure of the ACEC to motorized vehicles.

3.18 TRAFFIC / TRANSPORTATION

3.18.1 Applicable Regulations, Plans, Policies/Management Goals

The CDCA Plan's Motorized Vehicle Access Element seeks to manage motorized vehicle access on public lands, and designate areas for appropriate vehicle access. To these ends, the CDCA Plan seeks to constrain access to balance public and private needs, to avoid adverse impacts to desert resources, and to use maps, signs, and published information to alert users to motorized vehicle access situations (CDCA Plan, 1980, as amended).

The CDCA Plan also establishes five multiple-use classes that govern land use activities in the CDCA including controlled (C), limited (L), moderate (M), intensive (I), and Unclassified (U) uses. The CDCA Plan prohibits motorized vehicle access to lands in Multiple-Use Class C, which includes wilderness areas designated by Congress. Operations occurring on Class C lands are entirely dependent upon whether the proponent can prove that they possess existing rights that pre-date the declaration of the areas as wilderness or other restricted use areas.

The CDCA Plan allows access for mineral exploration and development, but indicates that travel corridors might be subject to closure or limitation in Multiple-Use classes L, M, and I. Multiple-Use Class L allows new roads to be developed pursuant to approved plans. Multiple-Use classes M and I allow new routes to be developed upon the authorized officer's approval (CDCA Plan, 1980, as amended). The HGLA is classified as multiple-use class L.

3.18.2 Affected Environment

This section describes the existing transportation and traffic conditions in Inyo County in and around the HGLA. Inyo County, the second largest county in California, is centrally located in the eastern part of the state. Ninety-eight percent of the lands within the County are owned by public agencies. The City of Bishop is the only incorporated city in the county. Given the rural nature of the communities, low development densities, and limited options for using alternate modes of travel, transportation in Inyo County is primarily by automobile. No passenger or freight rail service currently exists in the county, and air travel is limited.

Inyo County's road network is comprised of 3,520 miles of streets, roads, and highways (Inyo County 2009). The system is built around a framework of state and federal highways including US 395, US 6, State Road (SR) 127, SR 136, SR 168, SR 178, and SR 190, and Coso-Gill Station and Sykes Roads, two county roads. Other than US 395, SR 190 is the highway closest to the HGLA, merging with US 395 in Olancha approximately 11 miles north of the HGLA. Coso-Gill Station Road traverses the entire southern portion of HGLA. No other federal or state highways, or numbered County roads, are located in the vicinity of the HGLA (Figure 3.19-1).

US 395, the major north-south corridor that traverses Inyo County, is designated as a Rural Principal Arterial, is part of the National Highway System, and is included in the Subsystem of Highways for the Movement of Extra Legal Permit Loads systems (Inyo County 2009). It is a federal Surface Transportation Assistance Act route, authorized for use by larger trucks. Approximately 95 percent of the traffic on US 395 within Inyo County originates from outside the county, indicating that US 395 serves a significant amount of interstate and interregional travel.

As a result of its rural setting and lack of a diverse system of roads and highways in the vicinity of the HGLA, the scope of the following analysis is limited primarily to US 395 and, to a lesser degree, to SR 190.

3.18.3 Existing Conditions

3.18.3.1 Existing Access

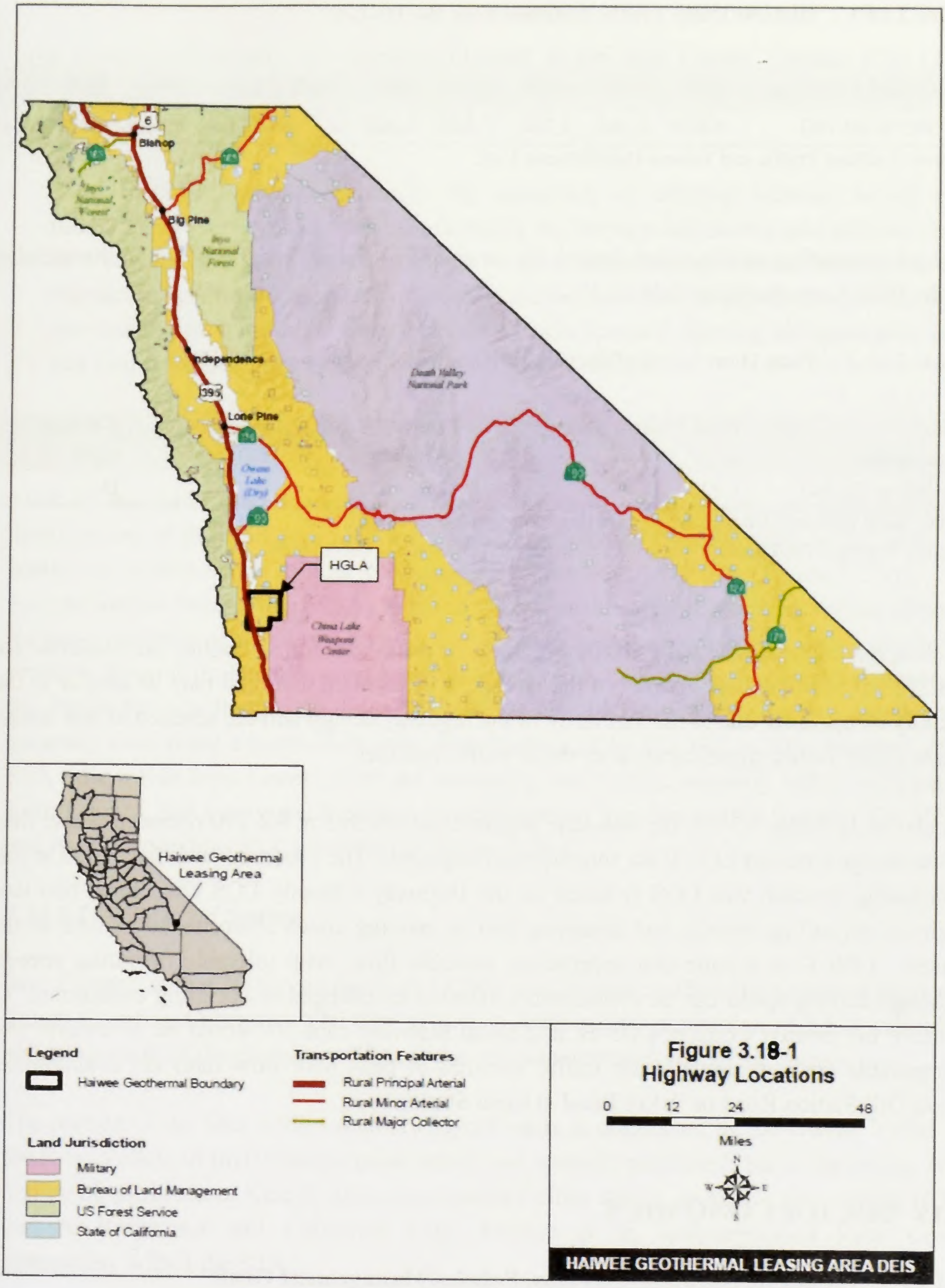
US 395 is the only highway providing access to the HGLA. Running in a generally north to south direction, US 395 crosses the southwestern portion of the HGLA (Figure 3.19-1). US 395 in Inyo County is generally a four-lane highway. A review of the Regional Transportation Plan's list of Short Range Projects (5-10 years) for US 395 indicates that segments from Olancha north, and from the Inyo-Kern County line south, are scheduled for four-lining (Inyo County 2009). However, future expansion plans for US 395 in the vicinity of the HGLA between Dunmovin and south of Coso Junction, are currently unknown. Although US 395 is an eligible State Scenic Highway in the vicinity of the HGLA, it has not been designated as such (CA DOT 2009).

SR 190 is the only other highway located relatively close to the HGLA (Figure 3.19-1). SR 190 terminates at US 395 in Olancha. Two un-numbered county roads provide the principal access to interior portions of the HGLA from US 395 in Coso Junction. Coso-Gill Station Road extends east from US 395 to provide access to the south-central portion of the HGLA; Sykes Road extends southwest from US 395, and provides access to the southwestern-most portion of the HGLA.

3.18.3.2 Existing Traffic Volumes

Roadway operations are measured in terms of level of service (LOS). LOS is a qualitative measure describing operational conditions within a traffic stream based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience. LOS is defined for each type of facility that has analysis procedures available in the Highway Capacity Manual 2000. Letters designate each LOS from A to F, with LOS A representing the best operating conditions and LOS F representing the worst. In addition, the Highway Capacity Manual further categorizes two-lane highways as either Class I or Class II. Class I facilities are two-lane highways with relatively high speeds and that are major inter-city routes, primary arterials connecting major traffic generators, daily commuter routes, or primary links in state or national highway networks. They often serve long-distance trips or provide connecting links between facilities that serve long-distance trips. Two-lane sections of US 395 in Inyo County are considered Class I (Inyo County 2009).

Figure 3.18-1 Highway Locations



The historic daily traffic volumes in the vicinity of the HGLA are shown in Table 3.19-1.

Table 3.18-1 Historic Daily Traffic Volumes near the HGLA

Route and Location	1996	1997	1998	2000	2001	2002	2003	2004	2005	2006
US 395 at SR 190	5,600	5,900	5,200	5,800	5,600	5,500	5,900	6,200	6,050	6,400

Source: Caltrans Traffic and Vehicle Data Systems Unit.

The corresponding existing peak hour LOS on state and federal road facilities in the vicinity of the HGLA are shown in Table 3.19-2.

Table 3.18-2 Peak Hour Level of Service on Roadway Facilities near the HGLA

Route and Description	Peak Hour Volume (two-way)	Truck Percentage	Concept LOS	Current LOS
US 395 at SR 190	1,020	12 %	B	**D**

Note: **Bold** indicates that the current LOS does not meet the Concept LOS.
Source: Caltrans Traffic and Vehicle data Systems Unit and Fehr & Peers 2008.

Although no comparable daily traffic volumes, or peak hour traffic counts, are available for US 395 in the immediate vicinity of the HGLA, it is assumed that both may be similar in the vicinity of the latter due to the similarity of the highway design and the absence of any feeder roads which would significantly alter these traffic volumes.

As shown in Table 3.19-2, the two-lane segments of US 395 at SR 190 operated worse than at the design Concept LOS B for this highway segment. The observed peak hour LOS at this monitoring location was LOS D based on the Highway Capacity 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, although driving speed can be considerably affected by changes in operating conditions. To achieve the desired Concept LOS B, additional highway capacity would be necessary. No comparable average annual daily traffic volumes or peak hour flow rates are available for Coso-Gill Station Road or Sykes Road at Coso Station.

3.19 SOCIOECONOMICS

3.19.1 Applicable Regulations, Plans, Policies/Management Goals

Few management goals for social or economic conditions or environmental justice in existing land use plans cover the HGLA.

Inyo County's Economic Development Element in the Inyo County General Plan (2001) addresses primarily tourism and redevelopment. However, one of its goals and related policy is relevant to the HGLA alternatives:

> "***Goal ED-4***: Actively encourage the expansion of existing industry of all types (including resource industries, manufacturing and service industries), and actively recruit new businesses that will bring new jobs to the County; ***Policy ED-4.1 Mining Industry*** Support the continued operation of existing mining activities within the County as well as new mining in appropriate areas, subject to each operator meeting all applicable safety and environmental laws, regulations, and County policies."

3.19.2 Affected Environment

Most of the anticipated economic and social effects associated with the exploration and development of the HGLA would occur in an area within about 60 miles to the north and south (i.e., within about an hour commuting distance) of the HGLA (Figure 3.20-1). This Socioeconomic Study Area (SSA) is based on reasonable work-home commuting distances for local residents or workers who may move to the area for work at any future geothermal projects. There is limited east-west accessibility into this area due to the barriers presented by the Sierra Nevada Range, the Inyo Mountains, and the Coso Range so that development generally runs along a north-south axis, largely serviced by US 395. A little over half of the SSA falls within Inyo County, with the remaining area falling primarily within northeastern Kern County, and a very small portion in northwestern San Bernardino County. The HGLA and its corresponding SSA are shown in Figure 3.20-1.

3.19.2.1 Regional Setting

Inyo County, with a 2009 population of 18,049, was formed in 1866 from parts of Mono and Tulare Counties, California. The City of Bishop, with a 2009 population of 3,536 individuals and lying north of the 60-minute SSA, is the only incorporated city in the county.

The portion of the SSA within southern Inyo County is dominated by the Owens Valley and the Rose Valley. In Inyo County, these valleys are sparsely populated, but in the Indian Wells Valley of northeastern Kern County, incorporated cities within an hour's drive of the HGLA include Ridgecrest and California City. Mojave is an unincorporated Kern County community within the SSA.

The China Lake Naval Air Weapons Station (NAWS) is also located in the Indian Wells Valley. China Lake NAWS is located in southern Inyo County to the immediate east of the HGLA, and includes portions of northwest San Bernardino and northeastern Kern Counties; it had a 2008 employment of 5,608 individuals (Greater Antelope Valley Economic Alliance 2009). Historically, the area of the Rose Valley, now occupied by the NAWS, had only scattered ranches.

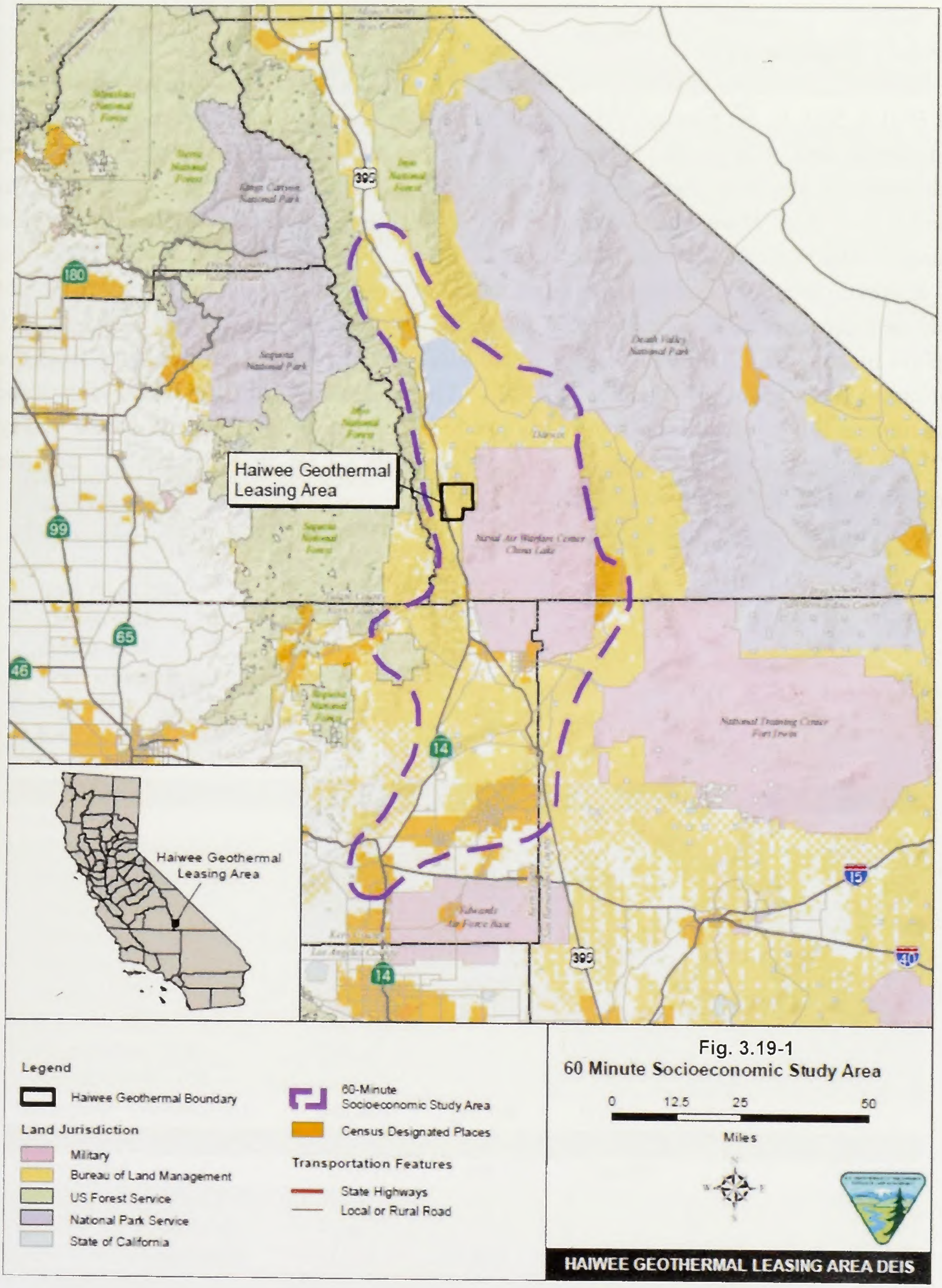
Further south within the SSA in Kern County is the Antelope Valley, a broad valley extending from Ridgecrest at its northern point south to the Angeles National Forest. Only the very northern portion of the Antelope Valley falls within the SSA; this northern portion of the Antelope Valley is referred to as Indian Wells Valley. Prior to the establishment of the Naval Ordnance Test Station at Inyokern in 1941 (now part of China Lake NAWS), Ridgecrest, with a 2009 population of 28,353, consisted of a few scattered farms and homesteads. Ridgecrest evolved during the 1950s and 1960s as a support community to the mission of NAWS by providing housing and services for federal employees and contractors. Ridgecrest was incorporated in 1963, and serves as the shopping and business center for northeastern Kern County as well as southern Inyo and northwestern San Bernardino Counties. The only other city within the SSA is California City (2009 population of 14,828). California City was founded in May 1958, and incorporated on May 25, 1965. A "planned" community, California City is the third largest incorporated city in California in terms of land area, and the eleventh largest in the United States.

Kern County, with a 2009 population of 827,123, was formed in 1866 from parts of Los Angeles and Tulare Counties. Only the far northeastern, relatively sparsely-populated portion of Kern County lies within the SSA.

A small portion of the SSA also extends into San Bernardino County. This area is extremely rural, with the exception of only the unincorporated communities of Red Mountain, Trona, Johannesburg, and Randsburg. Neither of these communities is a Census Designated Place (CDP) but they are included in the Red Mountain-Trona Census County Division (CCD).

In summary, the HGLA SSA is isolated from major economic hubs such as Bakersfield, approximately a two hour drive west of the SSA, and Los Angeles and Las Vegas, both of which are approximately four-hour drives from the SSA.

Figure 3.19-1 HGLA 60 Minute Socioeconomic Study Area



3.19.3 Existing Conditions

3.19.3.1 Population

The HGLA SSA is, on average, very lightly settled, with only two small incorporated cities (Ridgecrest and California City), and a few small, unincorporated communities (Independence, Big Pine, and Lone Pine in Inyo County; Lake Isabella and Inyokern in Kern County; and Red Mountain, Trona, Johannesburg, and Randsburg in San Bernardino County). The rest of the communities include dozens of very small settlements of up to a few hundred people. Due to the very rural nature of this area, population estimates are not made between decennial counts except for in the incorporated cities. Thus, Table 3.20-1 displays mostly Year 2000 data, except where more recent estimates are available from the California Department of Finance (CDOF). These data are also provided for some communities lying just outside the 60-minute SSA such as the Bishop and Death Valley CCDs in Inyo County, the Mojave and Lake Isabella CCDs in Kern County, and the Barstow-Victorville CCD in San Bernardino County.

Table 3.19-1 Historical Population Trends in the HGLA SSA and other areas outside the SSA

COUNTY/CITY/CCD/CDP (1)	2000 (2)	2005	2009	Average Annual Growth, 2000-09
Inyo County				
County Total	18,071	18,410	18,049	0.0%
Bishop CCD	12,216			
Bishop (incorporated)	3,575	3,608	3,536	-0.1%
West Bishop CDP	2,807			
Dixon Lane Meadow Creek CDP	2,702			
Mesa CDP	214			
Round Valley CDP	278			
Wilkerson CDP	562			
Death Valley CCD	638			
Furnace Creek CDP	31			
Shoshone CDP	52			
Tecopa CDP	99			
Independence CCD	2,612			
Big Pine CDP	1,350			
Independence CDP	574			
Lone Pine CCD	2,479			
Lone Pine CDP	1,655			
Cartago CDP	109			
Darwin CDP	54			
Homewood Canyon Valley Wells CDP	75			
Keeler CDP	66			
Olancha CDP	134			
Kern County				
County Total	661,653	753,698	827,173	2.5%
East Kern CCD	*69,614*			
Ridgecrest (incorporated)	24,927	27,427	28,353	1.4%
Randsburg CDP	77			
California City (incorporated)	8,385	11,510	14,828	6.5%
Mojave CCD				
Inyokern CDP	984			
Johannesburg CDP	176			
Edwards AFB CCD				
Bakersfield (incorporated)	246,899	296,108	333,719	3.4%
San Bernardino County				
County Total	1,710,139	1,946,312	2,060,950	2.1%
Red Mountain-Trona CCD	2,293			
Barstow-Victorville CCD	285,337			
Barstow (incorporated)	21,119	23,652	24,213	1.5%
California (mil)	**33.9**	**36.7**	**38.3**	**1.4%**

Source: California Department of Finance (CDOF 2009a) and United States Department of Commerce (2000) for year 2000 data.

The data in Table 3.20-1 show that Inyo County's population has essentially not grown over the past decade. In contrast, population growth in eastern Kern County was slow but evident. Ridgecrest showed an average annual growth rate (AAGR) of 1.4 percent, and growth was rapid in California City with an AAGR of 6.5 percent. As a result, some population growth likely occurred in the nearby Kern and San Bernardino unincorporated communities as well. In the recent past (1990s), the population of Ridgecrest has fluctuated greatly as staff and spending at the China Lake NAWS has changed with available federal funding.

To provide an approximate population estimate for the HGLA SSA, zip code data from the Census 2000 were used. Although not precisely the same as the exact area within a 60-minute SSA, the area represented by the summed zip codes comes reasonably close to it. Aggregating the appropriate zip codes, the 2000 population of the HGLA SSA is estimated at 55,000 individuals. These estimates are shown in Table 3.20-2.
These data also include population density estimates. The zip code area in which the HGLA is located (Olancha) had a very low population density of 0.9 persons per square mile. This density contrasts with an overall average of 10.6 persons per square mile in the total zip code area (a low population density). The communities of Ridgecrest, California City, Trona, and Lone Pine were the only zip code areas with other low-density urban type densities. Lone Pine is the only one of those located in Inyo County.
Although no further official estimates of the zip code populations have been made, it seems likely that the 2009 populations for Inyo County changed very little from the 2000 population of 5,231. (This assumes that the growth rate in the Inyo County portion of the SSA is similar to that of the rest of Inyo County.) In contrast, the growth in the Kern and San Bernardino populations has probably been on the order of 20 percent during the same period, yielding a current population estimate of about 65,000 persons.

Table 3.19-2 Census 2000 Populations by Zip Code

Zip Code	Area Name	County	2000 Population	Persons per Square Mile
92328	Death Valley-Homewood Canyon-Valley Wells	Inyo	442	0.2
93513	Big Pine	Inyo	1,816	7.2
93522	Darwin	Inyo	59	1.5
93526	Independence	Inyo	723	12.3
93545	Lone Pine	Inyo	1,890	45.5
93549	Olancha	Inyo	301	0.9
	INYO COUNTY TOTAL		**5,231**	**1.9**
93255	Onyx	Kern	653	2.5
93283	Weldon	Kern	1,920	7.3
93501	Mojave	Kern	4,873	12.1
93505	California City	Kern	8,311	77.1
93527	Inyokern	Kern	2,196	2.1
93554	Randsburg	Kern	105	1.7
93555	Ridgecrest	Kern	29,762	115.5
	KERN COUNTY TOTAL		**47,820**	**19.9**
93562	Trona	San Bernardino	1,988	57.6
		TOTAL	**55,039**	**10.6**

Source: United States Department of Commerce (2000).

Population Projections

Population projections for the three counties in the SSA call for continued growth above statewide projected rates for Kern (AAGR of 2.2%) and San Bernardino (1.3%) counties, which are slower than their 2000-2009 AAGRs. Continued lower-than-statewide growth for Inyo County (0.7%) is projected, but this is above its zero percent growth assumed since the year 2000. The projection for the state is for an AAGR of 1.1%. Population projections are shown in Table 3.20-3.

Table 3.19-3 Population Projections, HGLA SSA Counties, to 2050

	2000	2010	2020	2030	2040	2050	Avg. Annual Growth Rate 2010-50
Inyo County	18,181	19,183	20,495	22,132	23,520	25,112	0.7%
Kern County	665,519	871,728	1,086,113	1,352,627	1,707,239	2,106,024	2.2%
San Bernardino County	1,721,942	2,177,596	2,581,371	2,958,939	3,309,292	3,662,193	1.3%
California	34,105,437	39,135,676	44,135,923	49,240,891	54,226,115	59,507,876	1.1%

Source: State of California, Department of Finance (CDOF 2007).

It should be noted that the socioeconomics of the SSA within Kern and San Bernardino Counties may have more in common with rural Inyo County than with the more populous, agricultural, or urban areas of Kern and San Bernardino counties.

Published population projections specific to the HGLA SSA do not exist. But it is assumed that very little growth would occur in the southern Inyo County portion of the SSA, perhaps at the projected county-wide rate of 0.7 percent; however, until an economic recovery takes hold in the county, this assumed rate may be high. The Greater Antelope Valley Economic Alliance (2009) has published some projections for some of the subareas and zip codes in the Kern County portion of the SSA, which can serve as proxies for the entire area. These projections, shown in Table 3.20-4, call for only 0.2 percent AAGRs through the year 2030. In sum, the population projection for the Haiwee SSA through the year 2020 would be for very limited growth, amounting to perhaps only a few thousand more than its estimated 2009 population of about 65,000 persons.

Table 3.19-4 Population Projections, by Zip Codes, within the Kern County Portion of the Haiwee SSA

		2010	2020	2030	Average Annual Growth Rate
93501	Mojave	4,619	4,713	4,369	-0.3%
93527	Inyokern	1,904	1,866	2,268	0.9%
93554	Randsburg	45	39	298	9.9%
93555	Ridgecrest	30,965	31,602	31,084	0.0%
93505	California City	11,791	12,267	13,283	0.6%
	Totals	**49,324**	**50,487**	**51,302**	**0.2%**

Source: Greater Antelope Valley Economic Alliance (2009).

3.19.3.2 Social Environment

The characteristics of the social environment in the HGLA SSA were identified using secondary source data. Primary data or additional secondary data will be provided, as needed, in future, project-specific permit studies.

The social environment of the HGLA, like most of southern California, is ethnically diverse and multicultural. Although the HGLA lies in Inyo County, the broader social environment also includes portions of Kern and San Bernardino Counties that would capture much of the direct and indirect economic benefits of personal income and employment from developments in the HGLA. This broader three-county area has a population of about 2.9 million people; impacts compared in this broader context would be unnoticeable.

Lifestyles in this region reflect the communities' rural character, the region's ranching history and economy, the influence of China Lake NAWS, the population's multicultural character, and its draw for outdoor recreationists (which in turn depends on maintenance of the area's environmental amenities). The ample natural resources of this region such as its parks and varied desert and mountain landscapes attract visitors from nearby counties and states. The history of water rights issues, particularly in the Owens and Rose Valleys in Inyo County, further indicates that area residents are keenly interested in the area's natural resources. Scoping comments for this EIS focused heavily on concerns for the HGLA's potential impacts on groundwater resources, and general consumptive water needs.

3.19.3.3 Demographics

The specifics of the region's demography and economy are detailed in the following sections. These demographic and economic data offer a basis from which to assess the potential socioeconomic effects to the HGLA in the following chapter.

As described above, the HGLA SSA includes the lower Owens River Valley, Rose Valley, and Indian Wells Valley (northern Antelope Valley). Census 2000 racial and ethnic data for the broader three-county area and CCDs within the SSA are shown on Table E-1 in Appendix E. The corresponding age and gender compositions are shown in Table E-2. In summary, the CCDs shown in Appendix E, Table E-2, show a higher retirement-age, lower working-age, and higher under-18 populations in the Haiwee SSA than for the state as a whole. The workforce in the region also evidenced good competencies in high school and college education, but somewhat lower post-secondary accomplishment, based on the year Census 2000 data for persons over 25 years old. These data are summarized in Table E-3 in Appendix E.

3.19.3.4 Housing

This section examines housing supplies and occupancy in the SSA, focusing on the area within 60 minutes' drive of the HGLA. The reason for this geographic focus is that workers who may relocate to the area to work at future geothermal facilities will most likely prefer to live within commuting distance of such facilities, probably no more than an hour drive away. These in-migrating workers would require housing availability as well as local public services and facilities such as police and fire protection, schools, and water and sewer facilities.

During the temporary construction phase, the workers at the site are likely to prefer transient facilities (hotels and RV/mobile home parks). Workers with long-term jobs are likely to choose rentals or for-sale housing. Therefore, the availability of such housing is of prime importance in establishing sufficient capacity for these demands. Thus, both transient and long-term housing needs are addressed in this section.

Rental and Ownership Housing

Recent reliable and detailed rental and ownership housing data are not available for the HGLA SSA. The available standard data set comes from Census 2000, now out-of-date. They do, however, provide order-of-magnitude estimates of available rental housing stocks in the HGLA. These data are presented in Table 3.20-5.

In 2000, the stock of vacant housing-for-rent in the 60-minute SSA was 1,680 units. In contrast, 334 vacant units were for sale in the area. The overall rental vacancy rate was 6.5%, above the 5% threshold generally considered to constitute a tight rental market. Thus, even though Inyo County's overall rental vacancy rate was 8.5%, there was little availability due to its small stock of rental housing of only 929 total rental units.

According to the CDOF, about 208 housing units (rental and ownership) were added to the unincorporated housing supply between 2000 and 2008. For 2008, the CDOF reported a vacancy rate (combined rental and ownership) of about 16 percent in unincorporated Inyo County (CDOF 2009b). These data tend to confirm the general level of available rental units in Inyo County, based on the Census 2000 data of about 1,700 units; however, very few appear located in the SSA portion of Inyo County.

If the Census 2000 data are generally indicative of current and likely future baseline conditions, the main availability of vacant rental housing lies to the south of the HGLA in Kern County. Ridgecrest, with 940 vacant rentals available in 2000, and California City with 220 vacant rentals, are the closest areas to the HGLA; both had double-digit rental vacancy rates. In San Bernardino County, the Searles Valley area had 204 rental vacancies and a high rental vacancy rate of 44.3%.

Hotels and Other Transient Housing

In general, southern Inyo County has limited hotel, motel, and RV capacity. Ridgecrest, in neighboring Kern County, has the bulk of the available hotel and motel rooms. Within the Inyo County portion of the 60-minute SSA, availability of transient accommodations is limited almost entirely to Lone Pine, about a 40-minute drive from the HGLA. Lone Pine has a total of 311 hotel and motel rooms in about ten hotels. However, in the peak demand period of April to October, all its rooms are typically booked in advance. During the remaining off-season months, occupancy rates are reported at 75-80 percent (Lone Pine Chamber of Commerce 2009, personal communication), leaving about 65-80 rooms available, on average.

The two motels in Olancha have a total of 20 rooms, but are generally fully booked during the April-October peak season, with generally only a few vacancies in the off-season (The Rustic Hotel 2009, personal communication).

Table 3.19-5 Census 2000 Housing data, HGLA SSA

Zip Code		TOTAL UNITS	Occupied Units: Total	Occupied Units: Renter occupied	Occupied Units: Average household size	Vacant Units Only: Total	For rent	Vacancy rate	For sale only	Rented or sold, not occupied	For seasonal, recreational, or occasional use	For migrant workers	Other vacant
92328	Death Valley-Homewood Canyon-Valley Wells	340	248	187	1.78	92	2	1.1%	3	0	3	0	84
93513	Big Pine	840	725	174	2.44	115	14	7.4%	18	7	36	0	40
93522	Darwin	54	40	13	1.48	14	0	0.0%	0	0	11	0	3
93526	Independence	431	342	103	2.11	89	18	14.9%	12	3	37	0	19
93545	Lone Pine	977	806	328	2.31	171	44	11.8%	13	32	49	0	33
93549	Olancha	149	112	45	2.69	37	1	2.2%	3	1	10	0	22
INYO COUNTY TOTAL		**2,791**	**2,273**	**850**	**2.27**	**518**	**79**	**8.5%**	**49**	**43**	**146**	-	**201**
93255	Onyx	393	279	53	2.34	114	11	17.2%	12	4	53	0	34
93283	Weldon	1,180	850	152	2.26	330	11	6.7%	38	17	209	2	53
93501	Mojave	2,344	1,820	760	2.66	524	113	12.9%	43	28	98	0	242
93505	California City	3,525	3,038	1,001	2.72	487	220	18.0%	123	23	32	0	89
93527	Inyokern	1,212	926	182	2.37	286	44	19.5%	23	25	108	1	85
93554	Randsburg	130	61	12	1.72	69	0	0.0%	14	0	12	0	43
93555	Ridgecrest	13,646	11,769	3,970	2.5	1,877	947	19.3%	223	171	113	1	422
KERN COUNTY TOTAL		**22,430**	**18,743**	**6,130**	**2.53**	**3,687**	**1,346**	**18.0%**	**476**	**268**	**625**	**4**	**968**
93562	**Searles Valley (SAN BERNARDINO COUNTY TOTAL)**	**1,237**	**785**	**257**	**2.53**	**452**	**204**	**44.3%**	**44**	**13**	**21**	**0**	**170**
TOTALS		**28,931**	**24,066**	**24,066**	**2.27**	**4,865**	**1,680**	**6.5%**	**28,931**	**334**	**807**	**4**	**1,459**

Source: United States Department of Commerce (2000a).

Two recreational vehicle (RV) and mobile home parks are in the vicinity of the HGLA. These two parks contain 140 RV spaces combined. Like the hotels in southern Inyo County, these spaces are usually fully booked during the April-October peak season. In contrast, a total of only about 40 sites have historically been occupied in the off-season, although periodic construction projects such as the current Owens Lake dust control project can result in full or near-full occupancy (Boulder Creek Mobile Home and RV Park 2009, personal communication; Olancha RV and Mobile Home Park 2009, personal communication).

The nearest concentration of hotels and motels to the south is in Ridgecrest. Ridgecrest has nearly 1,000 total hotel rooms among the 16 hotels that were identified in an internet search. This total should increase to 1,100 rooms when two more hotels are completed in 2010. The Ridgecrest market is based primarily on activities and programs at China Lake NAWS, and only secondarily upon other business visitors and tourists. Major activities such as the "Empire Challenge" at NAWS (an international military competition) in July, and periodic film shoots bring in substantial numbers of hotel guests. The desert wildflower bloom in the West Mojave Desert, during March, April, and May, can often be a significant attraction to the area. At these times the city's rooms can be near-fully booked, but a fairly limited number of rooms can generally be found at other times during the April-October peak season (Ridgecrest Area Convention and Visitors Bureau, November 20, 2009, personal communication). Based on conversations with individual hotel personnel, substantial vacancies can be found in the off-season. The overall year-around occupancy rate in all Ridgecrest Hotels is estimated at 65 percent, with an estimated vacancy rate of 50 percent, on average, during the off-season.

3.19.3.5 Economic Conditions

Kern and San Bernardino Counties are geographically large, with the Haiwee SSA's 60-minute area encompassing only very small portions of their territory. Since employment and income time-series data are tabulated primarily at the much broader county level, these county-wide data may not be very applicable to the smaller SSA, although some inferences can be drawn from some historic data.[4] However, the Haiwee SSA does incorporate a significant portion of Inyo County and, as a result, county-wide data for Inyo County may be somewhat more indicative of conditions in the Haiwee SSA. This section presents the available employment and income data describing past and current economic conditions in the three counties, with application to the smaller SSA conditions where appropriate.

As with most of the United States, the Haiwee SSA, and Southern California in general, experienced a recession that began in 2007. Although Kern County did not see total

[4] Census 2000 employment and income data are tabulated from a household perspective to the level of Census Blocks, but are of limited usefulness in depicting 2009 conditions.

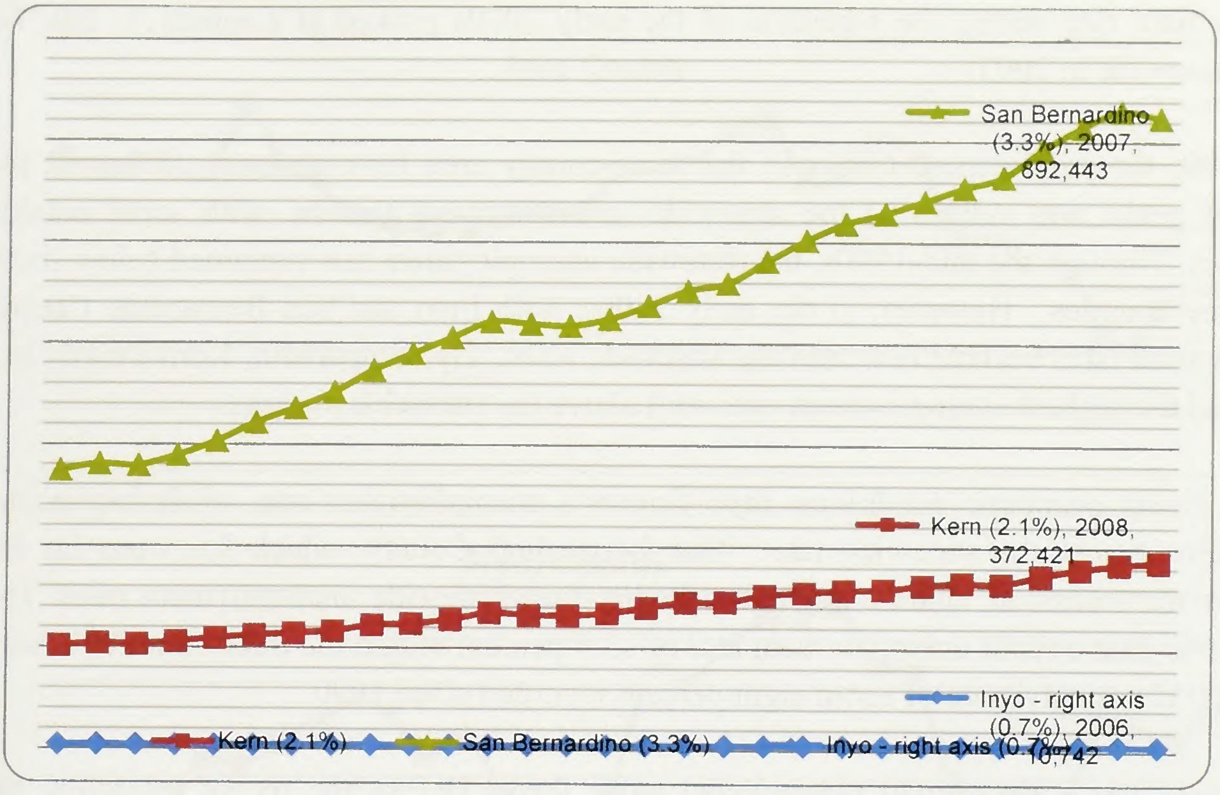
employment declines until 2009, healthy military and mining sectors in the region have compensated for the recession in the housing/construction industry. The historical data presented below are indicative of conditions before the third quarter of 2009, and therefore should be understood as depicting economic conditions 2007 to mid-2009.

Historical Employment

The three counties that contain the Haiwee SSA exhibited quite different employment trends from 1980 to 2008, the last full year for which data are available.[5] Inyo County experienced very slow overall growth, at an AAGR of 0.7 percent, and peaking at 10,742 people in 2006 before declining somewhat in the recession years of 2007 and 2008. Kern County's AAGR was a healthy 2.1 percent, peaking at an estimated 372,421 individuals in 2008, and showing none of the declines from 2006 as observed in Inyo County. Kern County's growth was slightly above the Statewide AAGR of 1.9 percent. San Bernardino County's employment grew most rapidly at an AAGR of 3.3 percent, peaking at 892,445 individuals in 2007 before declining slightly in 2008. These data are shown in Figure 3.20-2.

[5]Based on United States Department of Commerce, Regional Economic Information System (REIS) data through 2007 and extrapolation to 2008 using California Employment Development Department (CEDD) data. REIS data include all employment, while the CEDD data capture employment covered by Federal Insurance Contribution Act (FICA) only.

Figure 3.19-2 Historical Employment, 1989-2009: Inyo, Kern, and San Bernardino Counties (peak historical value shown)



Source: United States Department of Commerce (2009) for figures through 2007. Estimated for 2008 using California Employment Development Department (2009) ratios for 2008 to 2007.

Monthly employment figures, between 2007-2009, also were reflected differently in the three counties.[6] In Inyo County, employment after 2006 continued its decline with a larger drop through September 2009 than in 2007 or 2009. Kern County's employment declined in 2009, after growing in 2007 and 2008 contrary to national and state declines. The most significant declines occurred in San Bernardino County, which consistently continued its noticeable decline through September 2009. These data are shown in Figure 3.20-3.

Unemployment

When there is a larger pool of labor available to staff new developments, there is a lower need for hiring workers from other areas. The recent job employment declines have greatly increased the total number of unemployed persons in the broader three-county region as well as in the smaller Haiwee SSA. It should be remembered that Kern County is greatly influenced by seasonal agricultural jobs, unlike Inyo County. Current information on the unemployed workforce is summarized below.

---

[6] These data are FICA-employment only and do not include proprietors and other employment categories as do the previous annual data, and therefore are numerically lower, but likely do accurately depict year to year trends.

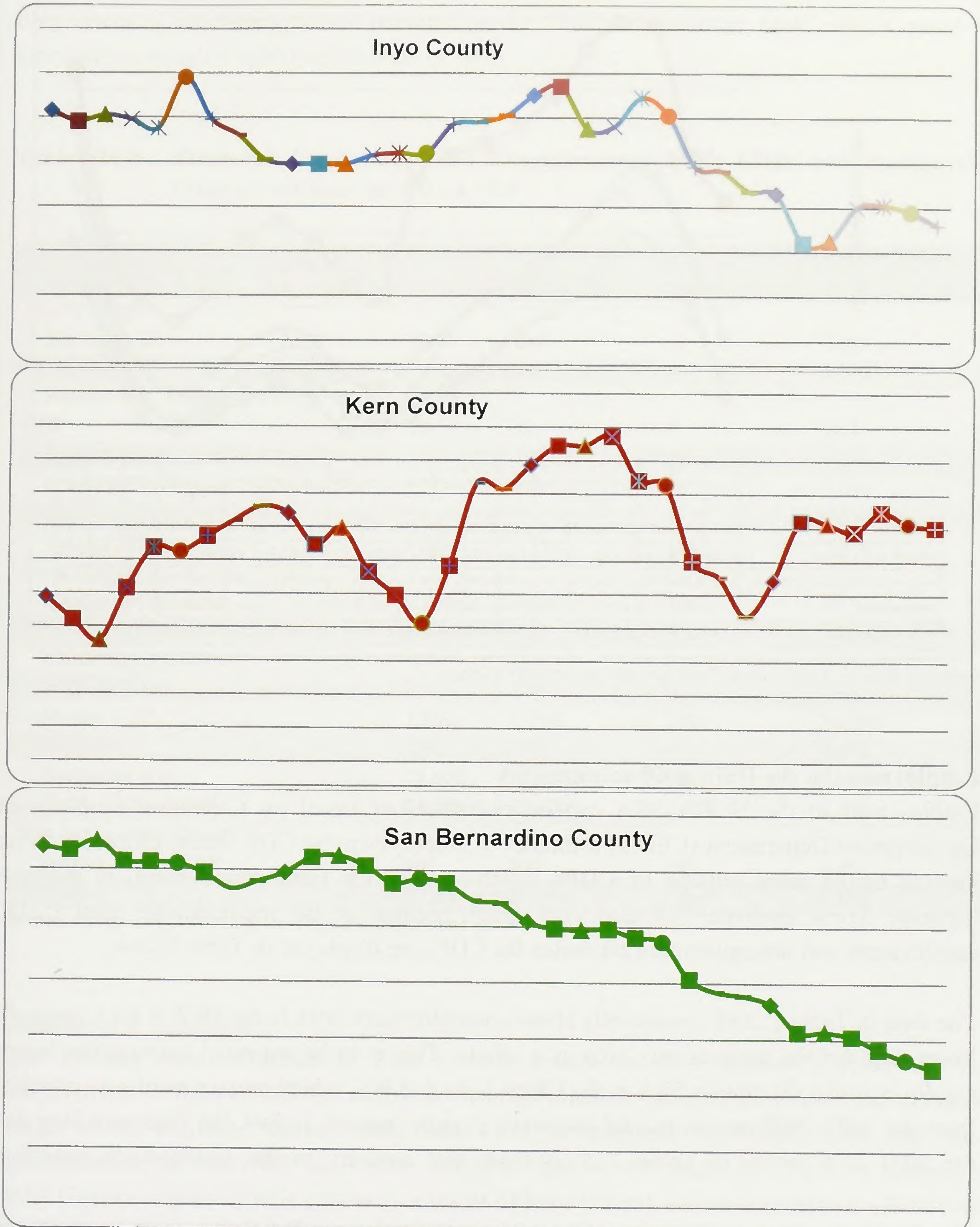
The recent employment conditions have increased unemployment rates in California to above those recorded in the 1991-93 recession, from a year-to-date 2009 average of 11.5 percent versus 9.5 percent in 1993 (Figure 3.20-4). For comparison, the annual average unemployment rate during the recession of the early 2000s peaked at a relatively low 7.4 percent statewide in 2003.

Since 1990, the employment trends in the three-county area have generally followed the pattern of peaks and valleys of the statewide unemployment pattern, with some notable differences. Through the mid-1990s, the statewide unemployment rate remained below those of all three counties. However, in the early 2000s, both Inyo and San Bernardino County unemployment rates became less than the statewide rates. By comparison, Kern County has always had the highest unemployment rate, well above the statewide average.

With the recent economic conditions, Inyo County's unemployment rate, while increasing, still remains below the statewide rate. San Bernardino County, which has been hit the hardest by the recession, again experienced higher-than-statewide unemployment rates. The 2009 year-to-date overall unemployment rate of 13.4 percent within the three counties is well above their historic average of about eight percent recorded since 1990.

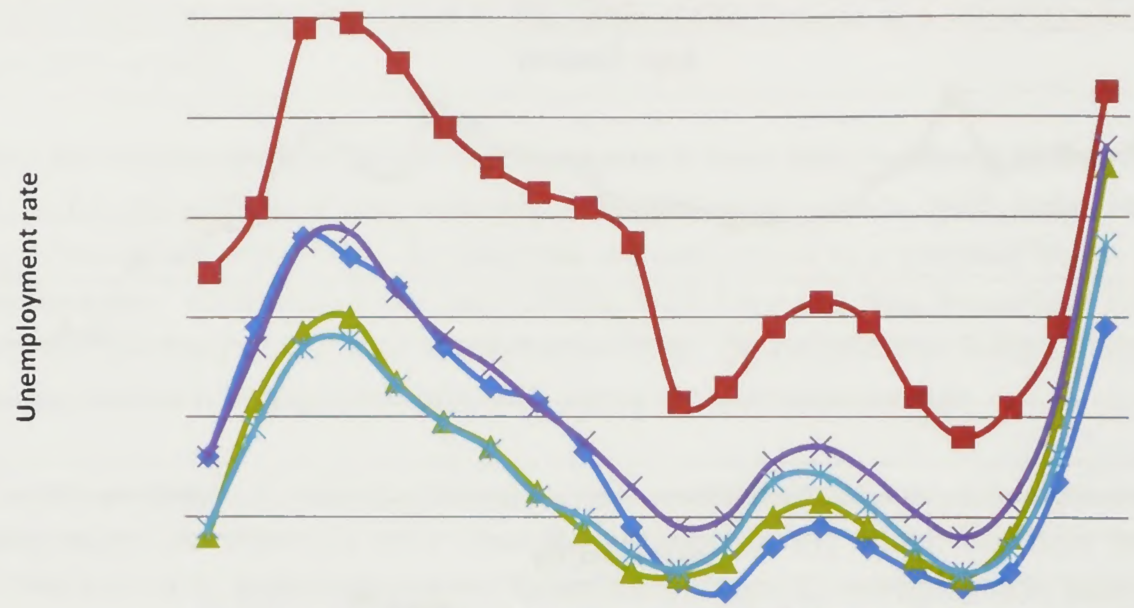
Inyo County has a very small unemployed work force. Before the recent recession, the historical average number of unemployed persons in Inyo County was less than 500 individuals. Currently, the number of unemployed persons is about 850. This relatively low increase in unemployment underscores the fact that although the HGLA is located in Inyo County, the county is unlikely to supply much of the labor needs of the any future projects envisioned under the Reasonably Foreseeable Development scenario.

Figure 3.19-3 Recent Historical Monthly Employment, 2007-2009: Inyo, Kern, and San Bernardino Counties



Source: California Employment Development Department (2009).

Figure 3.19-4 Historical Annual Average Unemployment Rates, 1990-2009: Inyo, Kern, and San Bernardino Counties, and Statewide



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009 (part)
Inyo County	7.2%	9.8%	11.6%	11.2%	10.6%	9.4%	8.6%	8.3%	7.3%	5.8%	4.7%	4.5%	5.4%	5.8%	5.4%	4.9%	4.6%	4.9%	6.7%	9.8%
Kern County	10.9%	12.2%	15.8%	15.9%	15.1%	13.8%	13.0%	12.5%	12.2%	11.5%	8.3%	8.6%	9.8%	10.3%	9.9%	8.4%	7.6%	8.2%	9.8%	14.5%
San Bernardino County	5.6%	8.3%	9.7%	10.0%	8.7%	7.9%	7.4%	6.5%	5.7%	4.9%	4.8%	5.1%	6.0%	6.3%	5.8%	5.2%	4.8%	5.6%	8.0%	13.0%
Totals	7.2%	9.4%	11.5%	11.7%	10.5%	9.6%	9.0%	8.2%	7.5%	6.6%	5.8%	6.0%	7.1%	7.4%	6.9%	6.1%	5.6%	6.3%	8.5%	13.4%
Statewide	5.8%	7.8%	9.4%	9.5%	8.6%	7.9%	7.3%	6.4%	6.0%	5.3%	4.9%	5.4%	6.7%	6.8%	6.2%	5.4%	4.9%	5.4%	7.2%	11.5%

Source: California Employment Development Department (2009a).

Employment in the Haiwee 60-minute SSA

Employment in the HGLA SSA can be characterized based on California Employment Development Department (CEDD) estimates of employment by CDP. These estimates do not include employment outside of CDPs which, except for farm employment, is probably minimal. These estimates are also very rough because of the methodology used.[7]CEDD employment and unemployment estimates for CDPs are displayed in Table 3.20-6.

The data in Table 3.20-6 consistently show unemployment rates in the HGLA SSA generally lower than for the three-county area as a whole. This is to be expected because the largest employer in the 60-minute SSA is the China Lake NAWS, where employment was insulated from the 2007-2009 recession, and increased slightly instead. In fact, the corresponding data for 2007 (not shown in Table 3.20-6) show that contrary to the county-wide condition,

[7] The CEDD estimates use employment and unemployment ratios from the 2000 Census, applied to current-year total county employment and unemployment data. Since both employment and residence locations have changed in the ensuing years, but are implicitly held constant in the method, the results must be viewed as indicative-only.

employment in the smaller SSA actually increased from 2007 to 2008. Conversely, the HGLA SSA has a lower unemployment rate than the broader three-county area (6.8 percent versus the 8.5 percent shown in Figure 3.20-5). The result is that, in 2008, there were likely only about 1,800 unemployed persons in the HGLA 60-minute SSA, which probably increased to roughly 2,000 individuals in 2009.

Table 3.19-6 Estimated Employment and Unemployment, 2008: CDPs and Incorporated Cities in and near the HGLA SSA

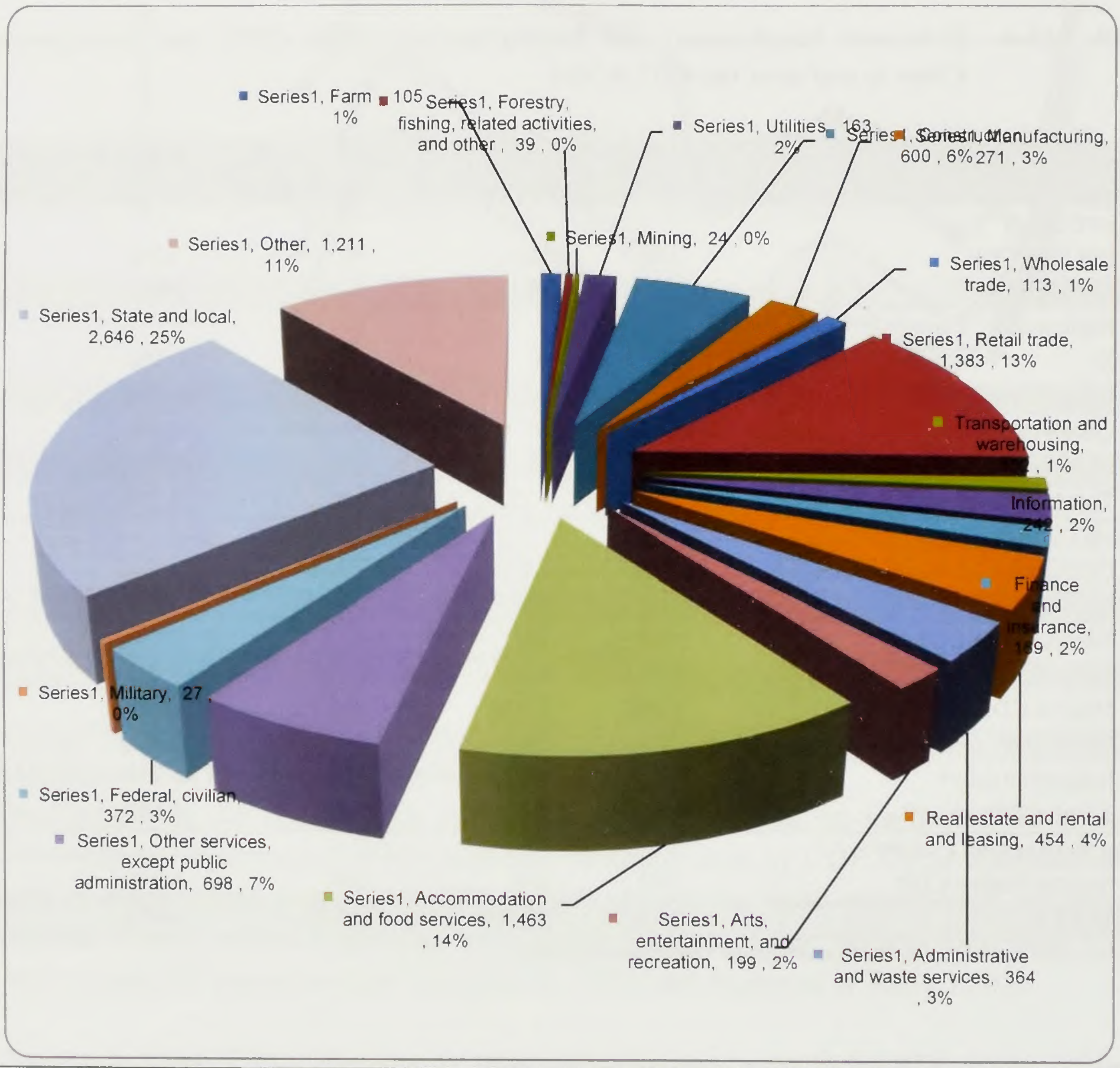
Area Name	Labor Force	Employment	Unemployed	Unemployment Rate
Inyo County				
Big Pine CDP	690	640	50	7.2%
Darwin CDP	20	20	0	0.0%
Homewood Canyon Valley Wells CDP	10	10	0	0.0%
Independence CDP	320	300	20	6.3%
Lone Pine CDP	810	740	70	8.6%
Olancha CDP	80	80	0	0.0%
Total, CDPs shown	**1,930**	**1,790**	**140**	**7.3%**
Kern County				
California City (city)	4,900	4,600	300	6.1%
Inyokern CDP	600	500	100	16.7%
Johannesburg CDP	100	100	0	0.0%
Kernville CDP	700	700	0	0.0%
Mojave CDP	1,900	1,700	200	10.5%
Onyx CDP	200	200	0	0.0%
Ridgecrest (city)	15,800	14,900	900	5.7%
Total, CDPs shown	**24,200**	**22,700**	**1,600**	**6.6%**
San Bernardino County				
Searles Valley CDP	900	800	100	6.3%
TOTALS	**27,030**	**25,290**	**1,840**	**6.8%**

Source: California Employment Development Department (2009b).

Employment by Industry

The primary base industries in Inyo County (based on each industry's share of total employment compared to the statewide average) include accommodations/food services; retail trade; utilities; federal, state and local government. However, state and local governments are not really an export industry; this sector's high concentration relative to total County employment is primarily a result of Inyo County's size. In addition, China Lake NAWS employment is included in Kern County employment counts, though part of it lies in Inyo County, and the remaining Civilian Military employment counted in Inyo County is quite small (372 jobs in 2007). Finally, employment by the various utilities is also relatively small. Thus, the tourism sectors of accommodations/food services and retail trade, which together accounted for over 3,000 jobs in 2007, are the main drivers of the Inyo County employment. Employment by industry data are shown in Figure 3.20-5.

Figure 3.19-5 Employment by Industry, Inyo County, 2007



Source: U.S. Department of Commerce, Regional Information System, 2009. CA25—Total Employment by Industry.
Notes: "Other" includes Professional, scientific, and technical services, Management of companies and enterprises, Health care and social assistance, and Educational services, data for which were suppressed due to confidentiality regulations.

Although agriculture is not a major sector of the Inyo County economy, its presence in the HGLA merits mention. At $16.6 million in products, Inyo County ranks 53rd in California in the value of agricultural production. Cattle and cattle feed crops dominate its agricultural activities. Thus, almost all the agricultural land in the county consists of low-intensity grazing land.

The prominent industries providing Kern County with its largest export base (based on each industry's share of total employment compared to the statewide average[8]) are agricultural and forestry services, farming, federal government facilities, and mining (including oil and gas exploration). None of these industries have numerically large employment, but they are critical to the overall health of the economy since they bring money into the economy which supports employment in local-market oriented industries such as retail trade and services (although larger sectors such as state and local governments and retail trade exist, they are not considered export industries). Until 2007, growth in Kern County's mining and federal civilian industries outweighed small declines in the farming and federal military sectors. This shored up total county employment so that some growth continued to occur.

The prominent export industries in San Bernardino County (based on each industry's share of total employment compared to the statewide average) are transportation and warehousing, federal military facilities, and administration services. Numerically, the retail trade and state and local governments are the largest sectors, but these serve local demands and are not part of the county's export base.

Since the construction skills required by the geothermal industry are expected to be similar to those in the mining and construction industries in the three-county area, local workforces in the construction and mining industries are briefly characterized below.

Both Kern and San Bernardino Counties have slightly larger construction sectors than the statewide average, reflecting their slightly higher population growth rates and roles as "exporters" of construction services. The national and statewide construction industry declines of 2007 and 2008 were also noted in the three-county area, which saw noticeable drops during the same period from the peak employment levels of 2006. These data are graphed in Figure 3.20-6. It is assumed that local construction employment declines have almost certainly continued, mirroring the statewide construction employment declines observed in 2009. Any increases in the 2010 or 2011 employment levels would depend on the strength of the current national and statewide economic recovery.

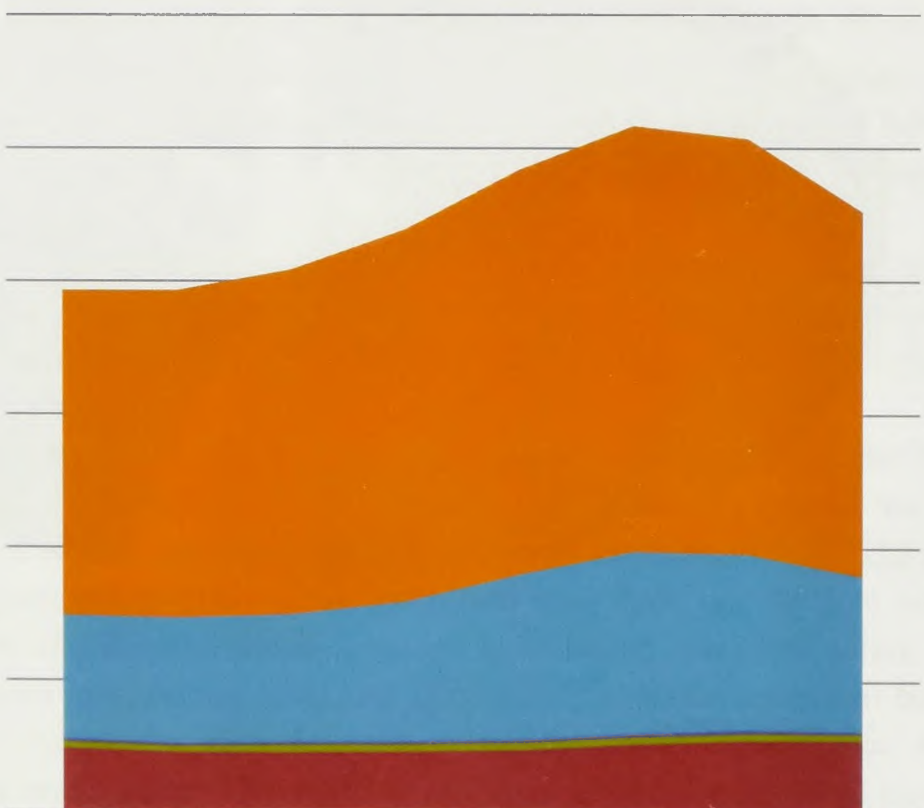
Construction employment in Inyo County makes up a slightly smaller proportion of its total employment compared to the statewide pattern, reflecting the general lack of growth in the county population. Of the total construction employment in the three-county area, San Bernardino County accounted for about two thirds in 2008, at about 55,000 jobs; Kern County accounted for about 22,000 jobs, while Inyo County accounted for only an estimated

[8] This ratio is called a "location quotient".

455 jobs in 2008. In all three counties, declines in construction employment from 2006 to 2008 indicate there is probably some availability of unemployed construction workers in the area.

Kern County accounts for over 90% of mining (including oil and gas facilities) employment in the three-county area. Kern County mining employment was an estimated 11,243 in 2008; San Bernardino County accounted for an estimated 885 jobs, and Inyo County only 24, a noticeable drop from its 115 jobs in the early 2000s. Despite this drop, the health of the Kern County mining sector indicates that there is probably not significant excess unemployment in mining in the three-county region.

Figure 3.19-6 Mining and Construction Employment, Inyo, Kern, and San Bernardino Counties, 2001-2008



	2001	2002	2003	2004	2005	2006	2007	2008
San Bernardino Construction	48,816	49,149	51,714	55,846	60,700	63,757	62,213	54,597
Kern Construction	18,522	18,841	19,192	20,995	24,729	27,270	26,353	23,202
Inyo Construction	492	461	468	490	551	590	600	455
San Bernardino Mining	948	875	1,077	1,045	1,033	1,010	959	885
Kern Mining	9,658	9,138	9,231	9,350	9,710	10,659	11,243	11,243
Inyo Mining	125	115	23	23	25	24	23	23

Sources: United States Department of Commerce (2009a). Updated to 2008 and estimated for Inyo County 2001 mining using California Employment Development Department (2009) data ratios for missing years in United States data by Economic Planning Resources.

Income

Per capita total personal incomes in Inyo County have historically been higher than in Kern or San Bernardino Counties, and also higher than statewide, non-metropolitan area averages. Furthermore, since 1990, Inyo County per capita total income growth has matched that of the statewide, non-metropolitan AAGR at 3.7 percent, while both Kern and San Bernardino per capita personal income growth has lagged somewhat, at 3.0 percent and 2.9 percent, respectively. Thus, by 2007, Inyo County residents had per capita total incomes of about $34,000, compared to $27,000 and $28,000 in Kern and San Bernardino Counties, respectively. Per capita earnings from working in Inyo County were about $19,000 in 2007, about the same as in Kern County; San Bernardino per capita earnings were about $22,000 (U.S. Department of Commerce 2009b). The main reason for Inyo County's higher per capita total incomes are higher non-wage incomes, including personal current transfer receipts (e.g. retirement benefits), dividends, and interest.

These averages partly reflect Inyo County's popularity for high-wealth and/or retired persons who seek residence locations that are not necessarily near job opportunities, but have attractive environmental amenities. The scenic quality and good weather of Inyo County are strong attractions for such residents. This factor is also reflected in the relatively high proportion of housing "for seasonal, recreational, or occasional use", as second homes are defined by the United States Census. Such housing makes up 6.2 percent of the Inyo County housing stock, compared to 1.9 percent statewide, in the year 2000 (United States Department of Commerce 2000).

The 1999 distribution of income in the CCDs (the year of income data for the Census 2000) in which the HGLA SSA is located, is shown in Table E-4, in Appendix E. These data show that the HGLA SSA had a higher proportion of individuals and households in the lower income brackets, and a lower proportion in the higher income brackets, than in the three-county area as a whole. By contrast, the East Kern CCD had the highest per capita income, as well as the lowest proportions of individuals and households in the lower income brackets of the geographies shown in Table E-4 in Appendix E.

3.19.3.6 Economic Forecasts

Based on current economic conditions, recovery in the national employment picture is of uncertain timing and magnitude, and most forecasters call for a slow employment recovery, with little or no improvement through 2010 and only mild improvement in 2011. Forecasts for Southern California are similar (Los Angeles County Economic Development Corporation 2009).

Authoritative economic forecasts for Inyo County do not exist. However, Inyo County employment levels did decline somewhat in 2009. Since the county economy is dependent largely upon its tourist industry for growth, improvements in the next few years' employment levels are contingent upon a rebound in its visitor/hospitality industry to a great extent. Since employment is not expected to rebound rapidly in California or the United States as a whole, discretionary household income may not provide a sufficient basis for growth in the Inyo County tourist industry, or result in a rebound in its overall employment at least through 2010, and possibly in 2011.

Authoritative, recent economic forecasts for Kern County also do not exist. However, total Kern County employment did not decrease between 2007 and 2008 (Figure 3.20-4) despite employment declines in the construction industry, largely because government and mining employment increased. As with the rest of the country, Kern County's total employment did decrease in 2009. Depending on the magnitude of improvements in the construction industry, actual increases in Kern County employment, if any, may not be substantial in the next two years. Similarly, recovery in the housing construction industry is not expected to be rapid. According to the Los Angeles County Economic Development Corporation (2009), the Riverside/San Bernardino County SMA is expected to suffer continued job losses through 2010, as it had in 2007-08 and 2008-09 (Figures 3.20-3 and 3.20-4). Overall, economic conditions in the Riverside/San Bernardino County SMA are not expected to improve significantly until at least 2011. No specific forecasts are presented for 2012 and beyond, but it is clear that the five year future for San Bernardino County is unlikely to show drastic economic increases above conditions that prevailed in 2006.

3.19.3.7 Public Services

This section examines public services in three main areas of the HGLA SSA: Unincorporated Inyo County, in which the HGLA is located, and the region's only two cities, Ridgecrest and California City. The public services addressed include police protection, fire protection, emergency services/hospitals, public water supplies, sewage collection and treatment, waste disposal, and schools.

3.19.3.8 Fiscal Conditions

The government costs and revenues for Inyo County, and for the cities of Ridgecrest and California City in Kern County, are summarized in this section. The California fiscal crisis has contributed to extreme difficulties for nearly all municipalities across the state, and the local jurisdictions are no exception. One primary difficulty shared by all jurisdictions is the

California property tax limitation law, "Proposition 111".[9] However, the national recession and structural problems in the State, and the local expenditure and revenue processes, are also critical. It is notable that all three jurisdictions have planned 2010 General Fund expenditures in excess of projected General Fund revenues. This situation necessitates transfers from other funds, primarily their reserves, to balance current year budgets in each jurisdiction.

It is notable that Inyo County has a revenue resource that provides some relief from revenue shortfalls that is not available to most other localities: Geothermal lease royalties. A brief description of these lease royalties is included below.

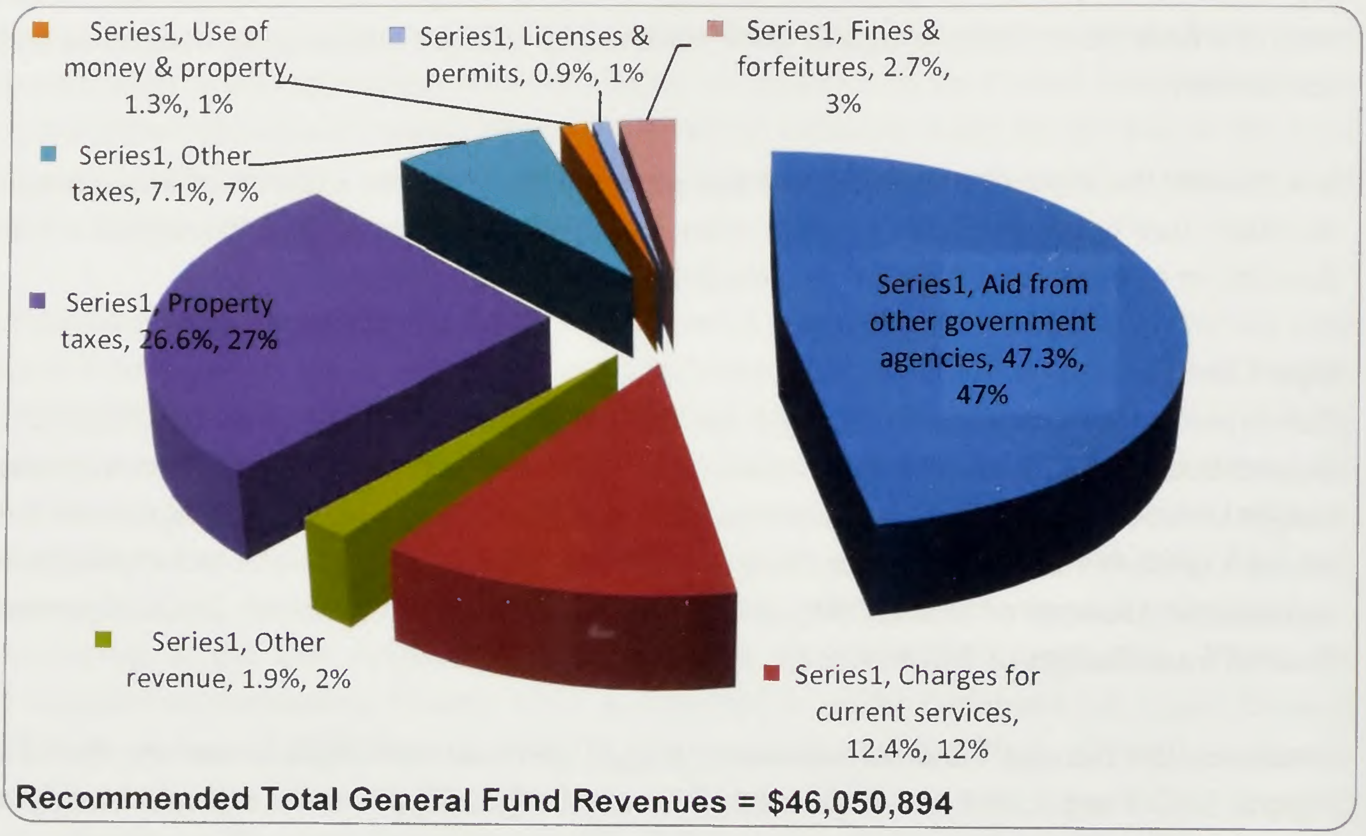
Inyo County

The Inyo County recommended budget for fiscal year (FY) 2009-10 totals $80,500,512 in expenditures and $74,473,660 in revenues. The General Fund portion of the recommended budget is $49,931,303 in expenditures, and $46,050,894 in revenues. These figures include use of $3,880,409 in Fund Balance from Fiscal Year 2008-2009. General Fund expenditures represent an increase of $1,082,094, or 2.22 percent over the FY 2008-09 Board Approved General Fund Budget of $48,849,209.

Details on the General Fund recommended budget revenues and expenditures are shown in Figures 3.20-7 and 3.20-8. At 47 percent of its total budget, Inyo County depends heavily on aid from other governments for its revenue base. The second most important revenue source is property taxes, projected at 27 percent of its projected total General Fund revenues. Its expenditures are primarily for General Government (33 percent of its total General Fund expenditures), and for public protection (36 percent).

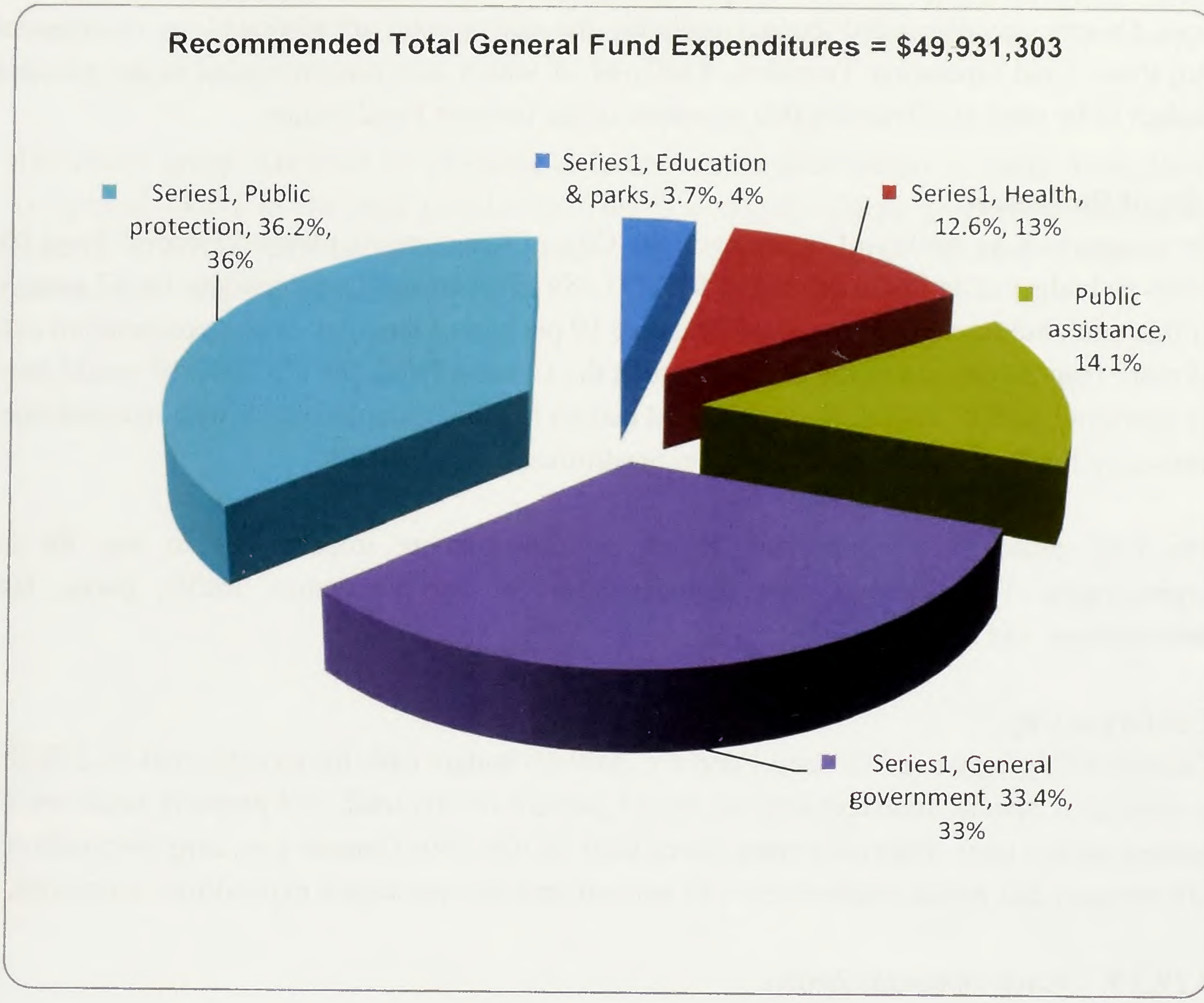
[9] In June 1990, the voters modified the original Article XIII-B (Proposition 4/Gann Limit) with the passage of Proposition 111 and its implementing legislation (California Senate Bill 88). Beginning with the 1990-91 appropriations limit, a City or County may choose annual adjustment factors. The adjustment factors include the growth in the California per capita income or the growth in the nonresidential assessed valuation due to construction within the City, and the population growth within the County or the City. Under Proposition 4, if a city ends the fiscal year having more proceeds of taxes than the Limit allows, it must return the excess to the taxpayers within two years (either by reducing taxes levied or fees charged).

Figure 3.19-7 Recommended Total General Fund Revenues, Inyo County, Fiscal Year 2009-2010



Source: Carunchio 2009.

Figure 3.19-8 Recommended Total General Fund Expenditures, Inyo County, Fiscal Year 2009-2010



Source: Carunchio 2009.

As noted earlier, Inyo County receives revenues from geothermal royalties under the Geothermal Royalty Fund of the federal government. To date, these revenues have not been a large part of the revenue base, but this source may become more important in the future. All federal revenues from geothermal development are deposited in the Geothermal Resources Development Account (GRDA) within the General Fund. From these revenues, 40 percent is redistributed to the counties of origin, another 30 percent is transferred to the Renewable Resources Investment Fund, and 30 percent remains in the GRDA, which is made accessible to the California Energy Commission for grants or loans to local jurisdictions or private entities. A total of $21,855,081 was distributed to California State and County governments in FY 2008 (Néron-Bancel 2009). In FY 2008, Inyo County received $548,565.

Pursuant to county policy, operating transfers of geothermal royalties are only made from revenue already received in the Geothermal Royalties Fund, and do not rely on geothermal royalty revenue that is expected, but has yet to be received this fiscal year. The FY 2009-10 Inyo County recommended budget includes the above total of $558,644 in Geothermal Royalties Fund Operating Transfers, $449,644 of which was recommended in the planned budget to be used to off-set eligible expenses in the General Fund budget.

City of Ridgecrest

By comparison to the Inyo County data, the City of Ridgecrest's planned General Fund FY 2009-10 budget calls for an estimated $11,407,559 in revenues. Taxes account for 67 percent of this total, but transfers from other funds are 19 percent of the total. With appropriation cuts of more than 20 percent to the departments in the General Fund, the FY 2009-10 would have an operating deficit. Therefore, the planned budget has been supplemented with minimal one-time-only funds to balance the planned expenditures of $11,934,398.

The City relies to an important degree on development impact fees to pay for its expenditures. These impact fees include those for fire protection, traffic, parks, law enforcement, and drainage.

California City

California City's planned General Fund FY 2009-10 budget calls for an estimated $6,222,583 in revenues. Special transfers account for 67 percent of this total, and property taxes are 17 percent of the total. Planned expenditures total $6,984,380; General operating expenditures (35 percent) and police expenditures (31 percent) are the two largest expenditure categories.

3.19.3.9 Environmental Justice

Two Census Block Groups are located within six miles of the HGLA: In Inyo County, Block Group 3 (in Census Tract 6), and in Tulare County, Block Group 5 (in Census Tract 27). These Block Groups are shown in Figure 3.20-9.

Race and Ethnicity

The Environmental Justice data are derived from the Census 2000, as specified by the Council of Environmental Quality (1997) guidelines. According to the Guidelines, a significant minority population exists if minorities comprise 50 percent or more of the affected areas (within six miles of alternatives) general population. For this analysis, a racial minority is defined as any person counted by the Census as any race other than "White only."

In 2000, the total population living in the two Census Block Groups that lie entirely or in part within six miles of the HGLA was 647 individuals. Persons classified as White comprised

87.3% of the total. For comparison, Inyo County residents classified as White comprised 79.7% of its population, and in Tulare County, 57.9% (only a very small part of Tulare County is within the 6-mile radius). The second largest racial group in all Block Groups within six miles of the HGLA was "some other race alone," at 7.7% of the total, followed by "two or more races" at 3.4%.

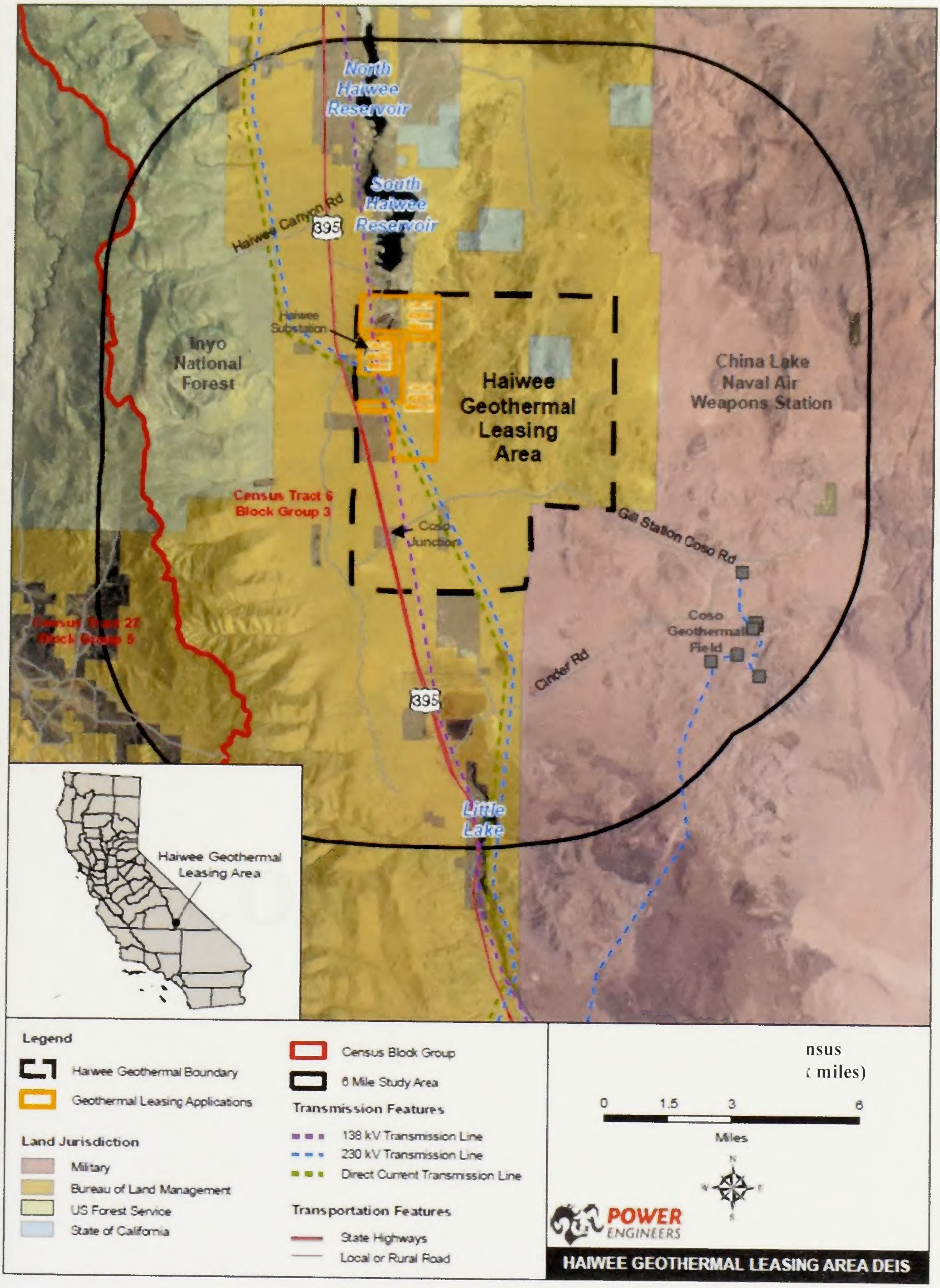
The ethnic group classified as "Hispanic or Latino" in the area within six miles of the HGLA comprised 14.1% of the total population. This is a slightly higher proportion than in Inyo County (12.5%), and substantially lower than Tulare County (50.8%). Table 3.20-7 summarizes race and ethnicity.

Table 3.19-7 Ethnicity and Race, Counties, Census Tracts, and Block Groups

	Inyo County	Census Tract 6, Inyo County	Block Group 3, Census Track 6, Inyo County	Tulare County	Census Tract 27, Tulare County	Block Group 5, Census Tract 27, Tulare County	Block Group 3, Census Tract 6 & Block Group 5, Census Tract 27 Combined
Total Population	**17,945**	**2,488**	**585**	**368,021**	**5,170**	**62**	**647**
White alone	14,304	2,000	508	213,250	4,176	57	565
Black of African American alone	17	3	0	6,196	61	0	0
American Indian & Alaska Native alone	1,706	181	7	4,702	556	0	7
Asian alone	224	9	0	12,336	36	0	0
Native Hawaiian and Other Pacific Islander alone	16	0	0	280	3	3	3
Some other race alone	801	179	48	114,223	220	2	50
Two or more races	877	119	22	17,034	118	0	22
Hispanic or Latino	2,247	601	85	186,913	469	6	91
Percent Total Population:							
Total Population	100%	100%	100%	100%	100%	100%	100%
White alone	79.7%	80.4%	86.8%	57.96%	80.8%	91.9%	87.3%
Black of African American alone	0.1%	0.1%	0.0%	1.7%	1.2%	0.0%	0.0%
American Indian & Alaska Native alone	9.5%	7.3%	1.2%	1.3%	10.8%	0.0%	1.1%
Asian alone	1.2%	0.4%	0.0%	3.4%	0.7%	0.0%	0.0%
Native Hawaiian and Other Pacific Islander alone	0.1%	0.0%	0.0%	0.1%	0.1%	4.8%	0.5%
Some other race alone	4.5%	7.1%	8.2%	31.0%	4.3%	3.2%	7.7%
Two or more races	4.9%	4.8%	3.8%	4.6%	2.3%	0.0%	3.4%
Hispanic or Latino	12.5%	24.2%	14.5%	50.8%	9.1%	9.7%	14.1%

Source: U.S. Department of Commerce 2000. Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data.

Figure 3.19-9 HGLA Census Block Groups (within six miles)



Low Income Status

The Environmental Justice analysis also addressed the low-income populations living in the two Census Block Groups within six miles of the HGLA. This analysis focused on Census 2000 data regarding the number of persons living below the "poverty threshold" in 1999, and added consideration of those under 150% of the poverty threshold.

The Census Bureau determines the poverty threshold, which represents a federal government estimate of the point below which a household of a given size has cash income insufficient to meet minimal food and other basic needs. It is set at a national level and does not vary by the region, only by the age of the householder and size of the household. It is adjusted each year using the Consumer Price Index. If a family's total income is less than the family's threshold, then that family and every individual in it is considered in poverty. The official poverty definition uses money income before taxes, and does not include capital gains or noncash benefits (such as public housing, Medicaid, and food stamps). The poverty rate used to classify tracts is based on calculations for people in the "poverty universe." The poverty universe, when using data from Census 2000, includes all United States residents except the institutionalized population, people in military group quarters and college dormitories, and unrelated individuals under 15 years of age.

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

THIS PAGE INTENTIONALLY LEFT BLANK.

TABLE OF CONTENTS

LIST OF TABLES:

LIST OF FIGURES:

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION AND OVERVIEW

This chapter analyzes the direct, indirect, cumulative and residual environmental consequences or impacts that could occur, or that are reasonably foreseeable, as a result of implementing each of the alternatives described in Chapter 2. The impact analyses are based on the assumptions and parameters detailed in the Reasonably Foreseeable Development (RFD) Scenario identified for the Haiwee Geothermal Leasing Area (HGLA) by the Bureau of Land Management (BLM) and presented in Chapter 2. Current and previous environmental, land use, and socioeconomic conditions in and around the proposed HGLA, as described in Chapter 3, served as the baseline for assessing the potential direct, indirect, cumulative and residual impacts anticipated from the RFD scenario to the individual resources of the HGLA.

Throughout this EIS process, and particularly in its impact assessments, the BLM has focused on the applicable management guidelines presented in the CDCA Plan, the WEMO Plan, and other directly applicable land planning documents. As such, the projected and potential impacts associated with implementation of the alternatives have been rated against the applicable CDCA Plan and WEMO Plan management guidelines where applicable. Moreover, virtually all public lands within the CDCA under BLM management have been designated geographically into four multiple-use classes based on the sensitivity of resources and kinds of uses for each geographic area. The HGLA falls within Multiple-Use Class L: Limited Use. Multiple-Use Class L is managed to protect sensitive natural, scenic, ecological, and cultural resource values. Public lands designated as Class L are managed to provide for generally lower intensity, carefully controlled, multiple use of resources while ensuring that sensitive values are not significantly devalued. The specific land use and management guidelines for each resource are included under each land use and resource discussion.

4.1.1 Impact Analysis Methodology

The impact assessment that follows focuses on the general impacts that could occur as a result of implementing each of the HGLA alternatives. The methodology for this assessment conforms with the guidance found in the following sections of the Council on Environmental 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).

CEQ regulations require that agencies "rigorously explore and objectively evaluate" the impacts of the alternatives to a proposed action. Three of the action alternatives in this Environmental Impact Statement (EIS) propose making part or all of the HGLA open and available for leasing of geothermal resources. Since there are no project-and site-specific exploration, development, and operational impacts, it is difficult to quantify specific, direct impacts of the Haiwee RFD scenario on locations or specific resources. For this reason, the following impact analyses and projections rely, to a certain degree, on observed impacts recorded at other, comparable geothermal energy development projects.

Neither the proposed CDCA Plan amendment nor issuance of the three pending lease applications will authorize any construction or development of any specific geothermal resources or facilities within the HGLA. A number of direct, on-the-ground impacts would likely result from implementation of the Haiwee RFD scenario and the development of geothermal resources within the HGLA. Geothermal exploration, development, operations, and any associated impacts, however, would not occur until the BLM further specifically approves those activities through additional NEPA analysis. The potential impacts of amending the CDCA Plan and authorizing leases within the HGLA are indirect. According to the CEQ regulations, indirect impacts "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 impact analyses address indirect impacts.

In addition to these foreseeable impacts from implementation of the RFD scenario, leasing of the federal geothermal resources could have other indirect impacts. For example, approval for BLM leasing in the HGLA may cause developers (lessees) to acquire surface use and mineral rights to adjacent, non-BLM lands for economic and/or technical reasons. The RFD scenario assumes that some degree of development would occur on non-federal as well as on BLM-administered lands. Another result might be an influx of residents onto nearby non-federal lands. Indirect impacts to non-federal lands from activities occurring on BLM-administered lands could thus include additional impacts to a variety of resources and land uses.

4.1.2 Terminology Used

Specific terms referring to the intensity, scope (geographic extent), and duration of impacts are used in this chapter. It should also be noted that impacts are not necessarily negative; some of the program-induced impacts represent positive benefits (e.g., employment, tax revenue for the local governments), 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 low level of detection; change would be difficult to measure.

Minor: The effect of an impact is slight but detectable; there would be a small change to existing conditions.

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 an 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. As such, the area is expected to be revegetated within a relatively short time. Construction traffic or noise impacts from drilling rigs would also be considered short-term.

Long-term: The effect occurs for an extended period after implementation of an action. Loss of vegetation from site preparation and construction, and the subsequent presence of the geothermal facilities and associated infra-structure, would be considered a long-term impact, since they would presumably last for the life of the geothermal facility.

4.1.3 Incomplete or Unavailable Information

Impacts to the various environmental, social, and land use resources of the HGLA and surrounding lands are quantified where possible. 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. This chapter identifies explicitly all impact projections based on incomplete information or best professional judgment.

4.1.4 Mitigation

Mitigation measures designed to reduce or avoid impacts are identified in Appendix A of this document as best management practices (BMPs); they will be applied by the Authorized Officer to the action alternatives, as appropriate. With any proposed project requiring additional authorization, site- and project-specific mitigation measures and stipulations may become part of that approval. Such measures are often based on the conditions at a specific location and on the characteristics of a specific proposed project. Therefore, mitigation measures and stipulations, in addition to those described in Chapter 2, may be developed and applied as needed.

4.1.5 Assumptions

Several general assumptions underlie the analysis of potential impacts of BLM's proposed actions. The following assumptions are common to all resources. Assumptions specific to a particular resource are listed under that resource's impact discussion:

- Operation of geothermal projects in the HGLA would last at least 30 years;
- Exploration would last six to 18 months;
- Drilling would last 90-150 days per well; and
- Geothermal plant construction would take four months.
- All action alternatives that authorize geothermal leasing will result in development activities outlined in the RFD as a maximum development scenario.
- The No Action Alternative would result in no reasonably foreseeable geothermal exploration or development.

4.1.6 Chapter Format

The following impact assessments are presented by resource. In turn, each resource's impact assessment section is divided into four subsections:

- Applicable management goals from approved land-use plans or other policy directives;
- Impact criteria relating to the assessment of the degree of impact;

- General impacts typically associated with geothermal energy development activities; and
- Anticipated and foreseeable 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 4.21)
- Irreversible or Irretrievable Impacts (Section 4.22)
- Short-term Use versus Long-Term Productivity of the Environment (Section 4.23)
- Residual Impacts (Section 4.24)

4.2 AIR QUALITY

4.2.1 Methodology

4.2.1.1 Management Goals

The California Desert Conservation Area (CDCA) Plan provides the following management direction for air quality protection in the CDCA, including the HGLA.

> These 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. These Class II objectives include, among others, attainment and maintenance of the ambient air quality standards and protection of visibility within the CDCA.

4.2.1.2 Impact Criteria

The potential for air quality impacts resulting from any future geothermal exploration or developments in the HGLA is assessed with respect to three criteria. Significant 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.

In addition to air quality impacts, significant impacts to global climate could occur if the following was to take place:

- Reasonably foreseeable future actions conflict with the provisions of Administrative Bill (AB) 32, the California Global Warming Solutions Act.

The analysis of indirect air quality impacts from exploration, development, production, or decommissioning activities 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, closure, or restoration. Impacts would be considered high if emissions are above *de minimis* levels, and/or an evaluation demonstrated that the emissions from the project would cause an exceedance of an air quality standard;

Medium
The risk of potential indirect impacts would be medium if moderate impacts to the above criteria occurred during exploration, development, production, closure, or restoration. Impacts would be considered medium if emissions are above *de minimis* or other significance thresholds, but further evaluation or mitigation measures would ensure that no exceedance of an air quality standard would occur (for example, through detailed modeling, or through obtaining offsets); 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, closure, or restoration. Impacts would be considered low if emissions are below *de minimis* or other significance thresholds, and would not cause an exceedance of an air quality standard.

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 (USEPA) and the states to regulate federal actions to a greater extent than they regulate private activities. The General Conformity Rule applies to federal actions in federal nonattainment or maintenance areas. A federal action is defined as any activity engaged in by a department, agency, or instrumentality of the federal government, or any activity that a department, agency, or instrumentality of the federal government supports in any way, provides financial assistance for, licenses, permits, or approves, other than activities related to transportation plans, programs, and projects. All federal actions must demonstrate that they conform to the applicable State Implementation Plan for the nonattainment area. It is the responsibility of the federal agency to make the determination that the federal action will conform to the State Implementation Plan.

Under the General Conformity Rule, the federal agency makes conformity determinations 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 USEPA included *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. These *de minimis* levels are based on the nonattainment classification of the area in which the federal action is proposed. Federal actions with emissions below the applicable *de minimis* levels are exempt from making a conformity determination under the General Conformity Rule. Table 4.2-1 presents *de minimis* levels based on nonattainment status.

In addition to evaluating whether emissions associated with a federal action are below the *de minimis* levels, a determination must be made to evaluate whether the emissions from a federal action are regionally significant. "Regionally significant" is defined as emissions that are 10 percent of a total nonattainment area's emission inventory for the nonattainment pollutant (or precursor pollutant). If a federal action's emissions are below the *de minimis* levels, and if the emissions are not regionally significant, the project is exempt from the General Conformity Rule.

In evaluating emissions from a federal action, the following emissions must be included:

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

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

Table 4.2-1 *De minimis* Levels for Exemption from Conformity Determination under the General Conformity Rule

Pollutant	*De minimis* Threshold, tons/year
Ozone (Precursor Emissions VOCs or NOx)	
Serious nonattainment areas	50
Severe nonattainment areas	25
Extreme nonattainment areas	10
Marginal and moderate ozone nonattainment and ozone maintenance areas outside an ozone transport region	
VOCs	100
NOx	100
Marginal and Moderate nonattainment and ozone maintenance areas inside an ozone transport region	
VOCs	50
NOx	100
Carbon Monoxide	
All nonattainment and maintenance areas	100
Sulfur Dioxide or Nitrogen Dioxide	
All nonattainment and maintenance areas	100
PM_{10}	
Moderate nonattainment and maintenance areas	100
Serious nonattainment areas	70
$PM_{2.5}$	
Direct emissions	100
SO_2	100
NOx (unless determined not to be a significant precursor)	100
Lead	
All nonattainment and maintenance areas	25

Source: 40 CFR Part 51

Key: VOCs = volatile organic compounds; NOx = oxides of nitrogen; PM_{10} = particulate matter with an aerodynamic diameter less than 10 microns; $PM_{2.5}$ = particulate matter with an aerodynamic diameter less than 2.5 microns; SO_2 = sulfur dioxide

As discussed in Section 3.1, the HGLA is located in Inyo County, California, which is part of the Great Basin Valleys Air Basin. The Great Basin Valleys Air Basin is considered an unclassified/attainment area for the National Ambient Air Quality Standards (NAAQS) for ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), fine particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and sulfur dioxide (SO_2). In the HGLA, the Owens Valley is classified as a serious nonattainment area under the NAAQS for suspended particulate matter less than or equal to 10 microns in diameter (PM_{10}), and the Coso Junction area is classified as an attainment/maintenance area under the NAAQS for PM_{10}. The GBUAPCD Governing Board adopted its *PM10 Maintenance Plan and Redesignation Request for the Coso Junction Planning Area* on May 17, 2010. This plan has been approved by CARB and the USEPA. Under this Plan, the Coso Junction area is designated as a maintenance area for PM_{10}. A conformity review would therefore be required for PM_{10} at the implementation stage of the program since it is designated as a maintenance area. In addition to concerns regarding PM_{10}, hydrogen sulfide (H_2S) is monitored within the HGLA region because it is present at the Coso Geothermal area. The GBUAPCD operates monitoring stations at Coso Junction and at the gate of the Coso Geothermal Plant to monitor concentrations of H_2S. In addition, the Coso Geothermal Plant is required to monitor ambient concentrations of H_2S within its property boundary. As a condition of its permit to operate, Coso Geothermal is required to report concentrations measured at its on-site monitors to the GBUAPCD and, should levels exceed eight parts per billion (ppb) at any single monitor, Coso Geothermal is required to shut down its operations to reduce H_2S emissions and concentrations. The Coso geothermal plant currently operates a scrubber to remove sulfur from its emissions. Any geothermal plant that would be permitted by the GBUAPCD within the HGLA would likely be subject to similar permit conditions to requiring it to monitor and, if necessary, mitigate its H_2S emissions.

4.2.2 Direct/Indirect Impacts

4.2.2.1 General Impacts

Criteria and Other Pollutants

The visible plumes commonly seen rising from some geothermal power plants are water vapor emissions (steam) from flash or steam-type geothermal plants. The RFD scenario estimates that up to two dual flash geothermal plants could be operating in the HGLA; therefore, steam plumes are potentially visible from the two locations. Because geothermal plants do not burn fuel like fossil fuel plants, they release comparatively low levels of air emissions during operations.

The following pollutants are generally associated with geothermal plants:

Hydrogen Sulfide (H_2S)

H_2S remains the pollutant generally considered to be of greatest concern for the geothermal community. H_2S can be emitted during well flow testing in the development phase of the geothermal plants, as well as in non-condensable gases released from a conventional (i.e., wet) cooling tower.

Oxides of Nitrogen (NOx)

Because geothermal plants do not burn fossil fuel, they do not emit NOx from energy production. Diesel fuels from drill rigs and trucks, as well as combustion emissions from construction equipment, vehicles, and occasional operation of emergency diesel generators would be a source of NOx during drilling and construction activities. However, in some cases where H_2S is present and combusted, negligible amounts of NOx are also produced.

Sulfur Dioxide (SO_2)

SO_2 forms when fuel containing sulfur is combusted at geothermal 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 the minor amounts of H_2S emissions.

PM_{10} and $PM_{2.5}$

$PM_{10}$and $PM_{2.5}$are emitted throughout the various stages of fossil fuel-fired electric power generation, 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 emit only small amounts of $PM_{10}$and $PM_{2.5}$from the cooling tower when steam condensate evaporates as part of the cooling cycle.

Carbon Dioxide (CO_2)

$CO_2$is a colorless, odorless gas that is released into the atmosphere as a byproduct of burning fossil fuels as well as respiration by living organisms. Geothermal plants emit small quantities of CO_2 compared to fossil fuel-fired plants. Some geothermal reservoir fluids contain varying amounts of certain non-condensable gases, including CO_2. Geothermal steam is generally condensed after passing through the turbine. The amount of CO_2found in geothermal fluid can vary depending on location, and the specific amount of CO_2actually released into the atmosphere can vary depending on plant design.

Mercury

Mercury occurs naturally in soils, groundwater, and surface waters, but human activity can release additional mercury into the air, water, and soil. Mercury is not present in every geothermal resource and is not an issue at the nearby Coso geothermal facility; however, if mercury is present in the Haiwee geothermal resource used for power production, mercury emissions could result depending on the technology used.

Volatile Organic Compounds (VOCs)

Geothermal plants may emit naturally occurring hydrocarbons, such as methane. Methane is the primary VOC emitted by geothermal plants, followed by ethane and propane. The USEPA's inventory of methane emission from electric plants does not include geothermal plants, because the amounts of methane emissions from geothermal resources are generally insignificant.

Other Reactive Organic Gases (ROG)
ROGs such as benzene could be released into the atmosphere from flash geothermal plants. The amount of ROGs that could be released into the atmosphere depends on the characteristics of a particular geothermal resource. Benzene and other ROGs are regulated as toxic air contaminants by the State of California and, if released in sufficient quantities, are subject to permit conditions that could require controls on flashed gases.

Ammonia
Naturally occurring ammonia is emitted by geothermal facilities. Geothermal energy production accounts for only a fraction of total ammonia emissions in the United States – substantially less than one percent; therefore, the impacts to air quality are negligible.

Arsenic
Dust derived from the Owens Valley (and including Rose Valley) is rich in As, Ba, and Sb that are deposited downwind. Ground disturbance and dust generation in the project area may present air quality problems in the short term for on-site workers and cumulatively add to the already enriched dust load blowing down the Owens Valley toward the communities along Highway 395 and into Ridgecrest. Arsenic concentrations in dust are much higher than in soils and sediments.

As a result, geothermal plants typically emit in a regional emissions budget only trace amounts of NOx, 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 applicable California standards.

Other than the use of standby emergency generators, fossil fuel combustion does not occur in the production of electricity at geothermal facilities.

4.2.2.2 Air Emissions Estimates
As discussed earlier, the USEPA 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 future project construction would be calculated to determine whether a project is exempt and therefore would have no impacts.

Emissions associated with geothermal exploration and development include surface disturbance (fugitive dust), heavy equipment exhaust, emissions from the drill rigs (which are assumed to meet Tier 3 standards, at a minimum), and employee and construction vehicles. Emissions from heavy equipment used in the construction of the geothermal plant were estimated based on emission factors for the South Coast Air Basin (SCAB) from the California Air Resources Board's (CARB) OFFROAD2007 Model (ARB 2007a), as published on the South Coast Air Quality Management District's (SCAQMD's) website. Emission factors for 2012 represent the average fleet emissions throughout the SCAB, and are considered representative of construction equipment that would be in use during construction of any future projects in the HGLA. Emissions from worker travel and truck traffic were calculated using the CARB's EMFAC2007 Model (ARB 2007b), which is available from the CARB, for on-road vehicles. Emissions of fugitive dust were estimated based on SCAQMD and USEPA emission factors.

To calculate emissions associated with geothermal plant development as outlined in the RFD, it was assumed that emissions would be associated with the following phases. These phases are assumed to be identical for all action alternatives (Alternatives A, C, and D).

Exploration

Exploration will include geophysical exploration such as seismic testing and the drilling of 20 temperature gradient wells. The total surface disturbance anticipated for exploration is 62 acres.

New Production Well Development

To support 30 megawatts (MW) of net geothermal generation, it is estimated that a total of 15 production wells and seven injection wells will need to be drilled over the course of the estimated 30-year useful life of each geothermal plant. It is assumed that initial development will involve drilling nine production wells and three injection wells. It is anticipated that one new well will be drilled every three years. It is anticipated that the total surface disturbance for two well fields (for two 30-MW geothermal plants) will be 202 acres.

Geothermal Plant Construction

Each of the two plant facilities would require about 20 acres, resulting in 25 acres of total surface disturbance including cut and fill requirements. Each plant would also require three miles of access road and four miles of new transmission line to intertie with an existing transmission line that runs through the southwest portion of the HGLA. As a result, the total disturbed acreage for the two geothermal plants is anticipated to be 120 acres.

Table 4.2-2 presents a summary of the construction emission estimates for the development of two 30-MW geothermal plants within the HGLA. Appendix F provides detailed descriptions of the emission assumptions and calculations. Estimates for building area and total disturbed area were based on data provided in Chapter 2 and Appendix F of this document.

The total annual emissions that are expected to result from construction activities within each phase of the RFD scenario are estimated as follows: Annual PM_{10} emissions are estimated to increase by 0.61 tons during exploration activities, by 2.56 tons per year during well field development activities, and by 1.22 tons per year during geothermal plant construction.

Table 4.2-2 Estimated Criteria Emissions from Construction in the HGLA

Emission Source	ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Total Emissions, lbs/day						
Exploration						
Fugitive Dust	-	-	-	-	48.36	10.16
Drill Rig Emissions	2.98	56.55	51.59	24.74	2.98	2.95
Off-Road Diesel	7.43	31.53	57.20	0.07	3.23	2.87
Construction Truck Trips	0.24	6.14	1.65	0.01	7.25	0.68
Worker Trips	0.47	0.86	7.91	0.01	0.14	0.05
TOTAL	**11.12**	**95.08**	**118.35**	**24.83**	**61.96**	**16.71**
Wellfield Development						
Fugitive Dust	-	-	-	-	157.56	33.09
Drill Rig Emissions	2.98	56.55	51.59	24.74	2.98	2.95
Off-Road Diesel	7.43	31.53	57.20	0.07	3.23	2.87
Construction Truck Trips	0.84	22.16	5.90	0.05	27.49	6.34
Worker Trips	11.04	20.85	188.84	0.13	2.78	1.00
TOTAL	**22.29**	**131.09**	**303.53**	**24.99**	**194.04**	**46.25**
Geothermal Plant Construction						
Fugitive Dust	-	-	-	-	93.6	19.66
Off-Road Diesel	11.32	45.44	88.60	0.10	4.88	4.35
Construction Truck Trips	0.49	12.28	3.29	0.03	14.49	3.36
Worker Trips	11.04	20.85	188.84	0.13	2.78	1.00
TOTAL	**22.85**	**78.57**	**280.73**	**0.26**	**115.75**	**28.37**

Total Construction Emissions, tons/year						
Exploration						
Fugitive Dust	-	-	-	-	0.24	0.05
Drill Rig Emissions	0.15	2.83	2.58	1.24	0.15	0.15
Off-Road Diesel	0.67	2.84	5.15	0.01	0.29	0.26
Construction Truck Trips	0.02	0.55	0.15	0.00	0.65	0.15
Worker Trips	0.04	0.08	0.71	0.00	0.02	0.00
TOTAL	**0.88**	**6.30**	**8.59**	**1.25**	**1.35**	**0.61**
Wellfield Development						
Fugitive Dust	-	-	-	-	0.79	0.17
Drill Rig Emissions	1.07	20.36	18.57	8.91	1.07	1.06
Off-Road Diesel	0.93	3.94	7.15	0.01	0.40	0.36
Construction Truck Trips	0.11	2.99	0.80	0.01	3.71	0.85
Worker Trips	1.38	2.61	23.60	0.02	0.35	0.12
TOTAL	**3.49**	**29.90**	**50.12**	**8.95**	**6.32**	**2.56**
Geothermal Plant Construction						
Fugitive Dust	-	-	-	-	0.47	0.10
Off-Road Diesel	1.41	5.68	11.08	0.01	0.61	0.54
Construction Truck Trips	0.07	1.66	0.44	0.00	1.96	0.46
Worker Trips	1.38	2.61	23.60	0.02	0.35	0.12
TOTAL	**2.86**	**9.95**	**35.12**	**0.03**	**3.39**	**1.22**

Pollutants emitted during the drilling phase also include emissions of non-condensable gases (H_2S, ammonia, metals, and hydrocarbons) from well flow testing. Current knowledge of the groundwater quality and of the locations of future well locations makes accurate predictions impossible for emissions from HGLA well flow testing. However, to provide a reasonable emissions estimate for the Haiwee RFD scenario, the projected emissions relied on the known emissions recorded during well flow testing for the Salton Sea Geothermal Unit #6 (California Energy Commission (CEC) 2002). Based on that example, and assuming that the initial phase of drilling would involve drilling and testing of nine production wells (assuming each production well would be tested for 96 hours) and of three injection wells (assuming each injection well would be tested for 24 hours), emissions for the Haiwee RFD scenario are estimated in Table 4.2-3.

Table 4.2-3 Potential HGLA Well Flow Testing Emissions

Pollutant	Production Single Well (lbs/hr)	Production 9 Wells (lbs total)	Injection Single Well (lbs/hr)	Injection 3 Wells (lbs total)	Initial Development Total 12 Wells (lbs)
PM_{10}	96.8	83635	56	4032	87667
H_2S	17.7	15293	14.7	1058.4	16351
Ammonia	70.8	61171	59.0	4248	65419
Arsenic – PM	4.43E-03	3.83	2.58E-03	0.18576	4.02
Arsenic – HC	1.87E-03	1.62	1.56E-03	0.11232	1.73
Benzene	0.330	285.12	0.275	19.8	304.92
Beryllium	4.10E-06	0.0035	2.39E-06	0.000172	0.0037
Boron	0.131	113.18	7.64E-02	5.5008	118.68
Cadmium	5.14E-04	0.44	2.99E-04	0.021528	0.46
Chromium	1.23E-06	0.0011	7.18E-07	5.17E-05	0.0012
Copper	1.64E-03	1.42	9.55E-04	0.06876	1.49
Ethylbenzene	1.94E-04	0.17	1.62E-04	0.011664	0.18
Lead	0.033	28.51	0.019	1.368	29.88
Manganese	4.10E-01	354.24	0.24	17.28	371.52
Mercury	3.52E-05	0.030	4.11E-05	0.002959	0.033
Nickel	8.24E-06	0.0071	4.80E-06	0.000346	0.0074
Selenium	2.04E-06	0.0018	1.19E-06	8.57E-05	0.0019
Toluene	4.54E-03	3.92	3.78E-03	0.27216	4.19
Xylenes	5.56E-04	0.48	4.63E-04	0.033336	0.51
Zinc	0.134	115.78	0.078	5.616	121.40

Radon Emissions

	Production Single Well (Ci/hr)	Production 9 Wells (Ci total)	Injection Single Well (Ci/hr)	Injection 3 Wells (Ci total)	Total 12 Wells (Ci/year)
Radon	1.35E-03	1.17	1.13E-03	0.08	1.25

If necessary, technology is available to control emissions of H_2S and other non-condensable gases associated with well testing by injecting hydrogen peroxide or other fluids .

Emissions Estimate for Geothermal Plant Operations

Vehicle emissions from employee and delivery vehicles, as well as emissions from the cooling towers, would be the primary sources of pollutants during geothermal plant operation.

The cooling towers are the primary source of air emissions at geothermal plants when using conventional (i.e., wet) cooling towers during normal operations. Such emissions include the non-condensable gases (NCGs), off-gassing releases from the condensate, and particulate matter (PM_{10} and $PM_{2.5}$). NCGs, which flow from the flashing steam of the brine, collect in the condenser of the turbine generator along with the condensate, where NCGs would be separated.

To control emissions of NCGs, NCGs can be vented to a system designed to remove these gases from the steam. NCGs can either be vented to a control system (such as a LO-CAT system or "Stretford" system), or be controlled via use of an iron chelate. This control system would remove the H_2S. However, in general, control systems for NCGs would also reduce emissions of other NCGs or volatized elements.

The amount of particulate matter would depend on the total dissolved solids present in the cooling tower brine. At this time, information is not available about NCG emissions or particulate matter from each cooling tower at the two geothermal plants. For comparison, the Salton Sea Unit 6 project estimated the following emissions for its cooling tower:

Table 4.2-4 Estimated Cooling Tower Emissions Salton - Sea Unit 6

Operational Source	VOC	PM_{10}	NH_3	H_2S
(lbs/hr)				
Cooling tower – NCG	0.375	-	0.12	0.766
Cooling tower – Off gassing	-	-	712	3.374
Cooling tower – Drift	-	2.91	0.0008	-
(tons/year)				
Cooling tower – NCG	1.64	-	0.526	3.36
Cooling tower – Off gassing	-	-	2,681	14.78
Cooling tower – Drift	-	12.74	0.0035	-

Drift eliminators can control emissions from wet cooling towers. For the HGLA estimates, installation of the drift eliminators was assumed so that drift rate would not exceed 0.0005 percent.

Emissions from employee and delivery vehicles are estimated in Table 4.2-5. Appendix F provides details on the emission assumptions and calculations.

Table 4.2-5 Estimated Vehicle Emissions HGLA Geothermal Plant

Emission Source	ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Total Vehicle Emissions, lbs/day						
Employee/Delivery Vehicles	3.93	7.27	66.83	0.05	1.17	0.41
Total Vehicle Emissions, tons/year						
Employee/Delivery Vehicles	0.49	0.91	8.35	0.01	0.14	0.05

The specific future emissions from the plants themselves will be accounted for in the construction/operating permit applications for review by the GBUAPCD.

As discussed above, the GBUAPCD would likely include a condition in the operating permit that requires monitoring for H_2S in the vicinity of an operating geothermal plant. As discussed in Chapter 3, the GBUAPCD currently operates monitoring stations at Coso Junction and at the gate of the Coso Geothermal Plant to monitor concentrations of H_2S. As a condition of its permit to operate, the Coso Geothermal Plant is required to monitor ambient concentrations of H_2S within its property boundary, and is required to report concentrations measured at its on-site monitors to the GBUAPCD. Another condition of its permit to operate is that Coso Geothermal is required to shut down its operations in the event that H_2S levels exceed eight ppb at any single monitor. Any geothermal plant that would be permitted by the GBUAPCD within the HGLA is expected to be subject to similar permit conditions to monitor H_2S.

Conformity Review Determination

Since projected annual emissions of PM_{10} under the Haiwee RFD scenario would not exceed the 100 tons per year *de minimis* threshold, either for construction or for operations, the development and operation of the two geothermal plants would be exempt from the General Conformity Rule, and would not require a conformity review.

Global Climate Change

According to the BLM Air Resource Management Program Manual, NEPA documents and Resource Management Plans (RMPs) should evaluate/address the role of climate and weather information in proposed actions and activities such as land use authorizations, smoke management, drought management, wilderness management, weeds management, mineral resource development, recreational uses, transportation management, and other resource management activities and decisions. Where appropriate and geographically applicable, managers should use other Federal and State agency climate and weather data.

Activities, programs, and projects initiated by the BLM and by operator-initiated activities and projects that the BLM authorizes, may affect and/or be affected by climate and climate change. Therefore, the BLM considers climate and potential or documented climate change integral to its planning and decision making process for renewable and non-renewable resource management. When conducting long-range planning, and when making major decisions pursuant to Secretarial Order 3226, the BLM evaluates:

1) how resources may be affected by climate change;

2) how to adapt land management practices due to the influence of climate change on biological and physical resources, and

3) how BLM land management practices may or may not contribute to the potential effects of climate change, including but not limited to emissions, sequestration, or mitigation of greenhouse gases.

This section therefore addresses how the RFD scenario in the HGLA would affect global climate.

According to the CEC (CEC 2006), CO_2 accounts for 84 percent of statewide greenhouse gas (GHG) emissions, with methane accounting for 5.7 percent and nitrous oxide for 6.8 percent of greenhouse gas emissions, respectively. Other pollutants account for the remaining percentage of GHG emissions in California. The transportation sector is the single largest source of California's greenhouse gas emissions, accounting for 41 percent of emissions statewide. In 2004, California produced 431 million metric tons of total carbon dioxide-equivalent emissions (not including energy imports).

The main source of greenhouse gas emissions from the HGLA would be combustion of fossil fuels during construction activities. Emissions of such GHGs were calculated using the same approach as the previous emission calculations provided for overall construction emissions. Table 4.2-6 summarizes the estimated emissions of GHGs. The corresponding emission calculations are provided in Appendix F.

Table 4.2-6 HGLA Construction Greenhouse Gas Emissions Estimates*

	CO_2	CH_4	N_2O
Exploration	651	0.06	0.50
Wellfield Development	2,726	0.49	1.10
Geothermal Plant Construction	2,816	0.27	1.32
TOTAL	**6,192**	**0.82**	**2.92**
Global Warming Potential	1	21	310
CO_2 Equivalent	6,192	17	905
CO_2 Equivalent Total	**7,114**		

*Emissions in metric tons per year

The SCAQMD recommends that construction emissions be amortized over a 30-year period to account for the program's contribution to overall GHG emissions. If amortized over a 30-year period, construction would contribute 237 metric tons per year of CO_2. The amortized CO_2 emissions of 237 metric tons are well below the CARB's proposed threshold of 7,000 metric tons per year required for reporting of GHG emissions and, in addition, would be temporary. This level of GHG emissions would not result in a significant impact on global climate, and the Haiwee geothermal leasing program would therefore not conflict with the provisions of AB 32.

Emissions of GHGs during geothermal plant operation would be associated with routine maintenance and inspection activities, and would not differ from existing conditions.

Because such geothermal plants are a source of renewable energy, the program would not contribute to GHG emissions, but facilitate achieving renewable energy goals.

4.2.2.3 Impacts by Alternative

The BLM evaluated the anticipated and potential impacts to the air resources of the HGLA and surrounding areas under five alternative scenarios. Four of these alternatives represent action alternatives and require amending the current CDCA Plan. Three of these (Alternative A, C, and D) also open some or all of the HGLA for leasing and development of the HGLA's geothermal resources.

<u>Alternative A</u> – **Open the Entire HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have the HGLA open and available for Geothermal Leasing; Authorize All Pending Lease Applications Within the HGLA**

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential air quality impacts associated with Alternative A are discussed in Section 4.2.2.2, above. Any future geothermal development project would be required to undergo permitting by the GBUAPCD, and to comply with all conditions of the air permit issued under that permitting process. For Class L, the CDCA Plan's Multiple-use Class L guidelines state that these areas will be managed to protect their air quality 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. In addition, leases issued under Alternative A would be subject to other applicable laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form. In the event that future site-specific permitting studies would identify sensitive resources that warrant protection or preservation, the BLM would stipulate appropriate, project-specific onsite mitigation measures.

The degree of impacts of Alternative A on the air quality of the HGLA and surrounding areas are considered low. In brief, the total annual emissions that are expected to result from construction activities within each phase of the RFD scenario are estimated as follows: Annual PM_{10} emissions are estimated to increase by 0.61 tons during exploration activities, by 2.56 tons per year during well field development activities, and by 1.22 tons per year during geothermal plant construction. Emissions associated with well testing could be controlled through injection of hydrogen peroxide or other fluids to control emissions of H_2S and other non-condensable gases from the wells.

Vehicle emissions from employee and delivery vehicles, as well as emissions from the cooling towers, would be the primary sources of pollutants during geothermal plant operation. The cooling towers are the primary source of air emissions when using wet cooling towers during normal operations. However, wet cooling towers are an unlikely option given the limitation of use of groundwater to compensate for evaporative losses in wet cooling towers. Moreover, as discussed above, technology exists to control emissions of non-condensable gases (NCGs), off-gassing releases from the condensate, and particulate matter (PM_{10} and $PM_{2.5}$) from cooling tower drift.

Since projected annual emissions of PM_{10} under the Haiwee RFD scenario would not exceed the 100 tons per year *de minimis* threshold, either for construction or for operations, the development and operation of the two geothermal plants would also be exempt from the General Conformity Rule, and would not require a conformity review. Finally, the anticipated level of GHG emissions would not result in a significant impact on global climate, and the Haiwee geothermal leasing program would therefore not conflict with the provisions of AB 32.

Alternative B – Close the Entire HGLA to Geothermal Exploration and Development; Amend the CDCA Plan to have the HGLA closed and unavailable for Geothermal Leasing; Deny All Pending Lease Applications Within the HGLA

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications.

Alternative B would not result in any air quality impacts because no geothermal development would occur within the HGLA.

Alternative C – Open the HGLA to Geothermal Exploration and Development with Restrictions of NO Surface Occupancy in Sensitive Areas; Amend the CDCA Plan to have the HGLA open and available for Geothermal Leasing; Authorize All Pending Lease Applications Within the HGLA (Preferred Alternative)

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the HGLA under restrictions of the No Surface Occupancy (NSO) stipulation NSO-HGLA-1. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres.

The NSO stipulation for specific areas of Alternative C will not change the application of the RFD to the HGLA. As a result, the foreseeable and potential air quality impacts associated with Alternative C would be generally similar to those for Alternative A.

Alternative D – Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have the HGLA open and available for Geothermal Leasing; Authorize All Pending Lease Applications Within the HGLA

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, approximately 13,773 acres would be closed and the remaining acres would be open in this alternative. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

The closure of specific areas, Alternative D will not change the application of the RFD to the HGLA. As a result, the foreseeable and potential air quality impacts associated with Alternative D would be generally similar to those for Alternatives A and C.

Alternative E –No Action

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA. The three pending lease applications would be denied.

Alternative E would not result in any air quality impacts because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines.

4.3 NOISE

4.3.1.1 Methodology

4.3.1.2 Management Goals

The CDCA Plan does not have any specific formal management goals for noise.

4.3.1.3 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 existing noise levels to sensitive receptors, or result in exposure of more people to high noise levels (BLM 2007).

4.3.2 Direct/Indirect Impacts

4.3.2.1 General Impacts

Given the location of existing, potentially sensitive noise receptors, construction noise from geothermal exploration and development activities, would not be expected to expose potentially noise-sensitive land uses to continuous noise sources louder than the existing sources such as off-highway vehicles. Noise would be generated by construction and well-drilling equipment during exploration and development and, at a lower level, during the subsequent operation of geothermal facilities. The principal noise sources during construction would be construction equipment and vehicles that would access the geothermal well and geothermal plant sites.

Construction Activities

Noise can be a potential concern during the temporary exploration drilling and geothermal plant construction phases. Construction equipment noise levels vary widely with the type of equipment used, and with the activity level or duty cycle (typical range is 45 to 120 A-weighted decibels [dB(A)]). In a typical construction project, the loudest short-term noise levels last only for a few minutes during each cycle. They typically occur during site preparation and grading from earth-moving equipment under full load (typically up to a maximum of 90 dB(A) at a distance of 50 feet from the source).

Construction equipment noise is usually considered to be a point source, with attenuation occurring within short distances at a rate of six dB(A) per doubling of distance (e.g., a noise level of 90 dB(A) at 50 feet will be 84 dB(A) at 100 feet, 78 dB(A) at 200 feet, and 72 dB(A) at 400 feet)).

Geothermal Plant

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. Heavy truck traffic at construction sites is generally fairly evenly distributed during the working day, while light vehicles related to the work force arrive and typically leave the site only once per day. Moreover, other than the development of the supply and injection wells, no significant construction is expected to occur during night times with the exception of occasional machinery deliveries. As such, noise from traffic related to the proposed geothermal development is not expected to have any long-term, adverse effects on the local communities or the recreational activities in the area. For analysis of the proposed action, a maximum one hour average noise level of 80 dB(A) at a distance of 50 feet from the construction area was assumed for the site preparation phase.

Well Pad Construction

Well pad construction and well drilling, as well as construction of the proposed geothermal power plants and ancillary facilities will require heavy equipment operations for grading, filling, compacting, and paving. After initial 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 dB(A) equivalent, average sound level (L_{eq})[10] at a distance of 50 feet.

Noise will also be generated from well drilling and testing equipment and would last approximately 200 days for each well drilled, and up to one day for each drill rig assisted flow test. Generally, the noisiest phase of geothermal drilling operations occurs when drilling with compressed air. Noise may also be generated by release of steam during drilling and for pressure relief. During brief well testing when the rig is on the site, the release of steam from the cyclonic separator/muffler may emit loud noise levels. Steam release noise will be infrequent and of short duration.

The maximum noise level generated by construction noise sources is expected to be 85 dB(A) at a distance of 50 feet. Thus, at a distance of 0.5 mile, construction noise of 85 dB(A) at 50 feet would be reduced to about 50 dB(A) (equivalent to rural or suburban residential areas during daytime). Construction noise would be expected to meet the ambient 65 dB(A) level (BLM 2007) at a distance of about 500 feet. Well pad construction is estimated to take approximately one week per pad site. Construction noise should be practically indistinguishable from other ambient noises at distances of approximately one mile.

Geothermal Plant Operation

Operational noise would be limited to generation and maintenance noises typical of a geothermal plant and its ancillary facilities, and to plant-related traffic. The steam turbine and cooling tower fans of each proposed geothermal plant would be the greatest source of long-

[10] The L_{eq} noise level may be considered as the continuous steady noise level that would have the same total A-weighted acoustic energy as a fluctuating noise over the same time period.

term noise generated by a project. Turbines can generate up to 85 dB(A) of noise at a distance of three to five feet from the turbines (DOE 2002). Cooling fans can generate noise levels up to 105 dB(a) at a distance of three to five feet from the fans. However, these potential noise levels would be reduced to 26 dB(A) at a distance of 0.5 mile. This noise level would be substantially less than a whispered conversation at six feet, thus not presenting an adverse impact on ambient noise conditions.

4.3.3 Impacts by Alternative

The BLM evaluated the anticipated and potential impacts to noise in the HGLA and surrounding areas under five alternative scenarios. Four of these alternatives represent action alternatives and require amending the current CDCA Plan. Three of these (Alternative A, C, and D) also open some or all of the HGLA for leasing and the use of the HGLA's geothermal resources.

<u>Alternative A</u> – **Open the Entire HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have the HGLA open and available for Geothermal Leasing; Authorize All Pending Lease Applications Within the HGLA**

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Groundwater extraction for consumptive use during exploration, development, and production would be allowed, but controlled or restricted by stipulation. Limited groundwater use may be allowed under certain conditions specified in Chapter 2 and in SA-HGLA-10. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential noise impacts associated with Alternative A are discussed in Section 4.3.2.1, above. Alternative A would result in some temporary and permanent increases in ambient noise levels in the HGLA. The degree of impact would vary with the location of potentially sensitive noise receptors relative to the locations of exploration and operation activities. The locations of potentially sensitive noise receptors, and the corresponding degree of impact, would be identified as part of future site-specific permitting studies. For noise-sensitive resources that warrant protection or preservation, the BLM would stipulate appropriate, project-specific mitigation measures. Noise levels would also have to comply with the applicable noise limits issued by Inyo County. Noise impacts from construction would be relatively short-term. Noise impacts from operations would be considered long-term and increase noise levels in the immediate area of the plants, but it would not produce significant increases in noise levels to receptors located more than 0.5

mile from the geothermal generating facilities. However, any future geothermal development project would be required to comply with Inyo County's noise ordinance, thus eliminating any significant impacts beyond the boundaries of the HGLA. In addition to meeting County maximum allowable noise thresholds, leases issued under Alternative A would be subject to other applicable laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form. In the event that future site-specific permitting studies would identify sensitive resources that warrant protection or preservation, the BLM would stipulate appropriate, project-specific onsite mitigation measures.

<u>Alternative B</u>– Close the Entire HGLA to Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Closed and Unavailable for Geothermal Exploration, Development and Leasing; Deny Authorization of All Pending Leases Within the HGLA

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications.

Alternative B would not result in any noise impacts because no geothermal development would occur within the HGLA.

<u>Alternative C</u> – Open the HGLA to Geothermal Exploration and Development with Restrictions of NO Surface Occupancy in Sensitive Areas; Amend the CDCA Plan to have the HGLA open and available for Geothermal Leasing; Authorize All Pending Lease Applications Within the HGLA(Preferred Alternative)

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the HGLA under restrictions of the No Surface Occupancy (NSO) stipulation NSO-HGLA-1. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres.

The NSO stipulation for specific areas of Alternative C will not change the application of the RFD to the HGLA. Therefore, the foreseeable and potential noise impacts associated with Alternative C would be generally similar as those for Alternative A. However, Alternative C would allow the BLM to control surface use and occupancy in specific areas of the HGLA, which would allow some reduction in noise to certain biological species. Any future geothermal development project would still be required to comply with Inyo County's noise ordinance, and leases issued under Alternative C would be subject to existing laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form.

Alternative D – Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have the HGLA open and available for Geothermal Leasing; Authorize All Pending Lease Applications Within the HGLA

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, 13,773 acres would be closed and the remaining acres would be open in this alternative. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

The selective closure of specific areas of Alternative D will not change the application of the RFD to the HGLA. The foreseeable and potential noise impacts associated with Alternative D would be generally similar as those for Alternatives A and C. However, Alternative D would allow the BLM to close specific areas of the HGLA, which would allow a reduction in noise to some biological species. Closing specific, noise-sensitive areas of the HGLA to geothermal exploration, development, and utilization would ensure that, in addition to meeting County maximum allowable noise thresholds, leases issued under Alternative D would have no unacceptable adverse noise impacts on such areas. In addition, leases issued under Alternative D would be subject to other applicable stipulations, BMPs, and mitigation measures as well as to existing laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form.

Alternative E – No Action

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA. The three pending lease applications would be denied.

Alternative E would not result in any on- or off-site noise impacts because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines.

4.4 TOPOGRAPHY, GEOLOGY AND SEISMICITY

4.4.1 Methodology

4.4.1.1 *Management Goals*

The resource management approaches contained in the Federal Land Policy and Management Act (FLPMA) include:

> "…responding to national priority needs for resource use and development, both today and in the future, including such paramount priorities as energy development and transmission, without compromising the basic desert resources of soil, air, water, and vegetation, or public values such as wildlife, cultural resources, or magnificent desert scenery."

The corresponding, most applicable management goals in the CDCA Plan for geology and mineral resources state:

- 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.

The CDCA Plan's Multiple-Use Class L guidelines provide no specific direction with regard to topography, geology, and seismicity issues.

4.4.1.2 *Impact Criteria*

The potential direct and indirect impacts of the Haiwee action alternatives on seismicity are assessed with respect to the following impact criteria:

- Increase in the number and magnitude of geothermal-induced seismic events.
- Increase in magmatic or hydrothermal activity.

The potential impacts on seismicity and volcanism from geothermal resource exploration, development, utilization, and decommissioning/reclamation are classified as high, moderate or low intensity over the short- or long-term. The following definitions of high, moderate, and low are used in assessing impacts from the action alternatives:

High
If there are significant impacts on the above criteria.

Moderate
If there are moderate impacts on the above criteria.

Low
If there are minor to no measurable impacts on the above criteria.

4.4.2 Direct/Indirect Impacts

4.4.2.1 *General Impacts*

As described in the Haiwee RFD, the direct impacts to the land surface of the HGLA as a result of geothermal exploration and development includes the grading and clearing of approximately 384 acres of land. This total includes the clearing of an estimated 62 acres for temperature gradient wells, 202 acres for the two well fields supplying geothermal resource to the two geothermal plants, and an estimated 120 acres for the two geothermal plants and associated road and transmission line infra-structure.

Some seismic or volcanic activity in the HGLA could occur from the land movement along faults, land shaking during earthquakes, or discharge of volcanic materials such as ash, volcanic gas or magma related to changes in subsurface pressures from the extraction and injection of geothermal fluids. However, design of geothermal resource production and injection would minimize changes in reservoir pressure. Geothermal induced micro seismicity (discussed below) is not of sufficient magnitude to rupture the ground, and geothermal induced volcanism is not known. Small local venting of hydrothermal fluids related to extreme shallow pressure drawdowns in some geothermal systems is not likely to occur in the HGLA because the resource is very deep and geothermal developments would be designed to minimize reservoir pressure changes.

The injection and/or extraction of geothermal fluids is known to induce small ($M<3$) earthquakes in many conventional fractured geothermal systems deeper than 0.6 mile (Majer, et al 2008). Most of the regional seismicity is micro seismicity that appears to be related to the geothermal development of the Coso geothermal field. Similarly, geothermal development in the HGLA may generate increased micro seismicity. In contrast to natural earthquakes, geothermally induced seismic events feel like "a pneumatic hammer, the thud of an object hitting the floor, or a passing truck". The number and extent of low-magnitude seismic events induced by geothermal development may be proportional to the size of the geothermal facility. There are no baseline data currently available to make a direct correlation to a previously undeveloped area.

The HGLA is currently largely undeveloped economically and has a small human population. The minor, transient nature of the micro seismic events typically related to geothermal activity, relative to the large seismic events which naturally occur in this area; suggest that damage would most likely fall in the nuisance category.

Extensive seismic networks are present to monitor earthquakes in the region operated by the Southern and Northern California Earthquake Centers (SCEC and NCEC) and a micro-earthquake (MEQ) network within the Coso geothermal field.

4.4.2.2 ***Impacts by Alternative***

The BLM evaluated the anticipated and potential impacts to the topography, geology, and seismicity of the HGLA and surrounding areas under five alternative scenarios. Four of these alternatives represent action alternatives and require amending the current CDCA Plan. Three of these (Alternative A, C, and D) also open some or all of the HGLA for leasing and the use of the HGLA's geothermal resources.

Alternative A – Open the Entire HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have the HGLA open and available for Geothermal Leasing; Authorize All Pending Lease Applications Within the HGLA

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Groundwater extraction for consumptive use during exploration, development, and production would be allowed, but controlled or restricted by stipulation. Limited groundwater use may be allowed under certain conditions

specified in Chapter 2 and in SA-HGLA-10. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres.

Development of HGLA's geothermal resources under Alternative A would result in the clearing and grading of an estimated 384 acres for well sites, well fields, and the geothermal generating facilities and associated infra-structure. In addition, utilization of the HGLA geothermal resource could result in some level in local micro seismicity, but the frequency, magnitude, and duration of such events cannot be predicted. However, such impacts are anticipated to be minor. As with most geothermal developments in deep fractured reservoirs for which injection is part of reservoir management, induced micro seismicity is a possibility. However, it is not likely to be significant given the small nature of the seismic events, the sparse population in the vicinity and, most important, the high level of natural seismicity. Extensive seismic monitoring would allow for potential induced seismicity to be monitored for each development.

Development of HGLA's geothermal resources under Alternative A would be conducted consistent with all applicable laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form. In the event that future site-specific permitting studies would identify sensitive resources that warrant additional protection or preservation, the BLM would also stipulate appropriate, project-specific onsite mitigation measures.

Alternative B – Close the Entire HGLA to Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Closed and Unavailable for Geothermal Exploration, Development and Leasing; Deny Authorization of All Pending Leases Within the HGLA

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications.

Alternative B would not result in any impacts to the topography, geology, or seismicity of the HGLA or surrounding area because no geothermal development would occur within the HGLA.

Alternative C– Open the HGLA to Geothermal Exploration and Development with Restrictions of NO Surface Occupancy in Sensitive Areas; Amend the CDCA Plan to have the HGLA open and available for Geothermal

Leasing; Authorize All Pending Lease Applications Within the HGLA (Preferred Alternative)

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the HGLA under restrictions of the No Surface Occupancy (NSO) stipulation NSO-HGLA-1. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres.

The NSO stipulation for specific areas of Alternative C will not change the application of the RFD to the HGLA. The potential impacts, specifically the projected grading and disturbance of an estimated 384 acres and potential for induced micro seismicity, under Alternative C are similar to those of Alternative A. The potential for impacts, under Alternative C, would be reduced or eliminated for the sensitive resources area by the NSO restrictions. The difference then, between alternatives, is that impacts are likely to be more spatially concentrated under Alternatives C and D than in Alternative A. In addition, implementation of the RFD scenario would be conducted consistent with all applicable laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form.

Alternative D – **Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have the HGLA open and available for Geothermal Leasing; Authorize All Pending Lease Applications Within the HGLA**

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, 13,773 acres would be closed and the remaining acres would be open in this alternative. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

The closure of specific areas under Alternative D will not change the application of the RFD to the HGLA. The potential impacts, specifically the projected grading and disturbance of an estimated 384 acres and potential for induced micro seismicity, under Alternative D are generally similar to those of Alternative C and to a large degree, Alternative A. The potential for impacts, under Alternative D, would be reduced or eliminated within the sensitive resources area by the closure restrictions. The difference then, between alternatives, is that impacts are likely to be more spatially concentrated under Alternatives C and D, than in Alternative A. As with Alternatives A and C, any future geothermal development project would be required to comply with all applicable stipulations, BMPs, and mitigation measures as well as to existing laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form.

<u>Alternative E</u> – No Action

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA. The three pending lease applications would be denied.

As a result, Alternative E would not result in any adverse impacts because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines.

4.5 SOILS

4.5.1 Methodology

4.5.1.1 *Management Goals*

There are no directly applicable CDCA Plan management goals or Multiple-Use Class L guidelines for soil resources. The most applicable goals in the CDCA Plan address geology and minerals resources 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 that 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.

4.5.1.2 *Impact Criteria*

Geothermal exploration and development will require new access roads, drilling platforms and sumps, production and reinjection wells, geothermal plant facilities, and pipeline and transmission line rights of way. All of these will entail land disturbance that will require appropriate permits for excavation, grading, and restoration. Clearing and the subsequent construction and operation activities will make the affected soils more vulnerable to erosion from wind and water. Potential impacts to soils were determined in accordance with Appendix G of the California Environmental Quality Act (CEQA) Guidelines. The resultant impacts analysis assessed whether an alternative would:

- Result in substantial soil erosion or loss of topsoil;
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of any project component, and potentially result in mass movement such as on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;
- Affect potential farmland, existing runoff patterns, or habitats through soil removal or loss of topsoil;
- Result in increased runoff from new impermeable areas such as roads, well pads, and plant facilities, which could lead to additional soil erosion; or
- Be located on expansive soil, as defined by the International Building Code (2000)[11] and International Code Council (2009), which could result in creating substantial risks to life or property.

4.5.2 Direct/Indirect Impacts

4.5.2.1 *General Impacts*

The anticipated impacts to soil resources from geothermal exploration and development include physical disturbance (e.g., movement or removal), compaction, changes to erosion patterns, and changes to the largely undisturbed conditions within the initial RFD impact

[11]The Uniform Building Code was replaced in 2000 by the International Building Code, which considers soils to be expansive if their expansion index is greater than 20 (determined in accordance with ASTM D 4829), or if they meet the following provisions (International Code Council, Inc.2009).

areas covering an estimated 384 acres of the 24,574-acre HGLA. Following post-construction reclamation, the soils in 276 acres of land will remain altered or removed.

The clearing of exploration and construction areas and access roads, drilling of wells, and the movement of vehicles and construction equipment could affect soils in a number of ways. The magnitude of these effects depends on many variables including present vegetative cover, soil slope, and soil characteristics such as texture, depth, moisture, and susceptibility to water and wind erosion. Site clearing activities could result in soil erosion or loss of topsoil in several HGLA soil map units because of their susceptibility to water and/or wind erosion. All of the soil map units in the HGLA are subject to water and/or wind erosion to varying degrees. Exploration and/or construction activities on steep or unstable soils in the HGLA could result in landslides, subsidence, or other mass movements. Mass movements often result from a combination of several factors such as the location of construction sites on unstable soils or steep hillsides, inappropriate placement of fills, modification of surface flow, or inadequate drainage structures. Two characteristics that decrease the stability of soils are cave-in potential and shrink-swell potential. A number of HGLA soils are unstable due to cave-in potential, shrink-swell potential, and/or steepness (slopes ≥ 15%).

The movement of heavy construction vehicles and equipment could also result in soil compaction that can result in increased runoff unless controlled and decreased productivity for plant growth since the compacted soil cannot readily exchange gases with the air, or absorb water and plant nutrients. Because the water absorption rate is reduced, water from precipitation runs off compacted soils more readily, and increases soil erosion. Clearing of vegetation typically also increases runoff on any soil unless controlled. As stated above, several of the soil map units in the HGLA are susceptible to erosion. Erosion and loss of topsoil, in turn, affects vegetation cover and wildlife habitats. Soils in the HGLA are not generally used as farmland; they are generally rocky, steep, shallow, or have other limitations that make them unsuitable. In most areas, the lack of irrigation water also limits agricultural development. Only one soil map unit in the HGLA is known to contain farmland: Dunmovin loamy coarse sand, zero to five percent slopes, supports a small amount of irrigated crop acreage (Rockwell International 1980).

Site-specific soils investigations and mapping would take place prior to final facility planning and construction as part of any future permitting studies to identify areas of high erosion hazard and unstable or expansive soils. Construction of the well pads, geothermal plants, and ancillary facilities would be subject to specific stormwater measures contained in the project's Stormwater Pollution Prevention Plan (SWPPP) to prevent erosion and sedimentation of surface waters. The SWPPP 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. Representative BMPs implemented during all phases of construction would include road maintenance, grading, culvert maintenance and installation, water runoff controls, 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 exposed ground with a protective cover of organic material such as wood chips or vegetative groundcover. Because these construction activities would include implementation of BMPs and other mitigation measures, overall impacts to the soils of the HGLA are expected to be negligible.

Depending on the location of future geothermal projects, exploration and/or development in the HGLA could also potentially occur on an expansive soil. One soil map unit in the HGLA (Neuralia-Timosea-Typic Argidurids Complex) meets all three criteria required for a soil to be considered expansive. Three additional soils (Dunmovin Variant-Nebona Variant-Alko Variant Complex, Nebona Variant-Alko Variant Cobbly Stone Complex, and Rock Outcrop Haiwee Variant Complex) meet two of three criteria. They are also classified as being very fine-grained. However, the Soils Technical Report for the Coso Geothermal Study Area (Rockwell International, 1980) does not provide specific information about soil particle size, as required by the third criterion.

However, no significant soil conditions are currently known to exist that would preclude development of the Haiwee RFD scenario in the HGLA. A number of soil map units within the area are susceptible to water and wind erosion, but BMPs and mitigation measures would be implemented to minimize or eliminate those impacts. The HGLA soil map units with the most limiting characteristics include:

1. Nebona Variant – Alko Variant cobbley loamy sands, 5 to 30 percent slopes. This soil has the most limiting characteristics of all the map units in the Coso Soil Map area. It is susceptible to water erosion, has shrink-swell potential, has a slope equal to or greater than 15%, and is expansive. This soil unit covers a large area, approximately 5 sections in the south-central portion of HGLA.

2. Dunmovin Variant – Nebona Variant – Alko Variant complex, 2 to 9 percent slopes. This soil is susceptible to wind and water erosion, has shrink-swell potential, and is expansive. It is found in a relatively small area in the southeastern corner of the HGLA (Section 8).

3. Rock outcrop – Haiwee Variant complex, 30 to 50 percent slopes. This soil is susceptible to water erosion, has a slope equal to or greater than 15%, and is expansive. It is found in the northeastern corner of the HGLA over approximately 160 acres.

4. Maynard Lake loamy coarse sand, 15 to 30 percent slopes, and Maynard Lake loamy coarse sand, 2 to 15 percent slopes, have the same characteristics, and are both located in the southeastern portion of the HGLA. Both are susceptible to wind and water erosion, have cave-in potential, and have slopes equal to or greater than 15%.

5. Stumble loamy coarse sand, 15 to 30 percent slopes, Stumble loamy coarse sand, 2 to 15 percent slopes, and Stumble loamy coarse sand, 30 to 50 percent slopes, are three soil units with similar characteristics, and location. All are located in the northeastern portion of the HGLA, susceptible to wind and water erosion, have cave-in potential, and have slopes equal to or greater than 15%.

Environmentally sensitive siting of future RFD facilities, and application of the appropriate BMPs and mitigation measures, are expected to reduce impacts to soils to less than significant levels, resulting in only minor and local, if any, soil loss from the HGLA.

4.5.2.2 ***Impacts by Alternative***

The BLM evaluated the anticipated and potential impacts to HGLA soils under five alternative scenarios. Four of these alternatives represent action alternatives and require amending the current CDCA Plan. Three of these (Alternative A, C, and D) also open some or all of the HGLA for leasing and the use of the HGLA's geothermal resources.

Alternative A – Open the Entire HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have the HGLA open and available for Geothermal Leasing; Authorize All Pending Lease Applications Within the HGLA

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Groundwater extraction for consumptive use during exploration, development, and production would be allowed, but controlled or restricted by stipulation. Limited groundwater use may be allowed under certain conditions specified in Chapter 2 and in SA-HGLA-10. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to HGLA soils associated with Alternative A are similar to those discussed in Section 4.5.2.1, above. The degree of impacts to soils will vary with the soil characteristics of future development sites, but consistently includes temporary soil alterations to 384 acres of the HGLA, and long-term alteration to 276 acres. However, adherence to state and county soil erosion and sediment control measures and construction stormwater management regulations would minimize or eliminate other impacts such as erosion and compaction outside construction areas. In addition, leases issued under Alternative A would be subject to other applicable laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form. In the event that future site-specific permitting studies would identify sensitive resources that warrant protection or preservation, the BLM would stipulate appropriate, project-specific onsite mitigation measures.

Alternative B – Close the Entire HGLA to Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Closed and Unavailable for Geothermal Exploration, Development and Leasing; Deny Authorization of All Pending Leases Within the HGLA

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications.

Alternative B would not result in any soil impacts because no geothermal development would occur within the HGLA.

Alternative C – Open the HGLA to Geothermal Exploration and Development with Restrictions of NO Surface Occupancy in Sensitive Areas; Amend the CDCA Plan to have the HGLA open and available for Geothermal Leasing; Authorize All Pending Lease Applications Within the HGLA(Preferred Alternative)

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the HGLA under restrictions of the No Surface Occupancy (NSO) stipulation NSO-HGLA-1. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres.

The NSO stipulation for specific areas of Alternative C will not change the application of the RFD to the HGLA. The foreseeable and potential impacts to HGLA soils under Alternative C would be generally similar to those for Alternative A, and also result in long-term soil impacts over 276 acres of HGLA soils. These impacts, however, might be more spatially concentrated due to the NSO stipulation. Due to the flexibility that drilling technology provides, some soils may be avoided by design and routing. This alternative provides the BLM an opportunity to issue additional restrictions for potentially sensitive or unsuitable soils, thus reducing unacceptable adverse impacts.

<u>Alternative D</u> – Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have the HGLA open and available for Geothermal Leasing; Authorize All Pending Lease Applications Within the HGLA

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, approximately 13,773 acres would be closed and the remaining acres would be open in this alternative. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

The closure of specific areas under Alternative D will not change the application of the RFD to the HGLA. The foreseeable and potential impacts to HGLA soils associated with alternative D could result in long-term soil impacts to over 276 acres and are generally similar to those of Alternative C and to a large degree, Alternative A. The potential for impacts, under Alternative D, would be reduced or eliminated within the sensitive resources area by the closure restrictions. The difference then, between alternatives, is that impacts are likely to be more spatially concentrated under Alternatives C and D, than in Alternative A. This alternative allows the BLM to close some unsuitable or sensitive soil map units to development, thus further reducing unacceptable adverse impacts.

<u>Alternative E</u> – No Action

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA. The three pending lease applications would be denied.

Alternative E would not result in any impacts to HGLA soils because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines.

4.6 WATER RESOURCES

4.6.1 Methodology

4.6.1.1 *Management Goals*

Surface Water

There are no management goals provided for water resources in the CDCA Plan, although its multiple-Use Class L guidelines address water quality and wetlands as follows:

- Areas designated in this class will be managed to provide for the protection and enhancement of surface and groundwater resources, except for instances of short-term degradation caused by water development projects. Best management practices, developed by the BLM during the planning process outlined in the Clean Water Act, Section 208, et seq., will be used to avoid degradation and to comply with Executive Order 12088.

- Wetland/riparian areas will be considered in all proposed land-use actions. Steps will be taken to provide that these unique characteristics and ecological requirements are managed in accordance with Executive Order 11990, Protection of Wetlands (42 CFR 26951), legislative and Secretarial direction, and BLM Manual 6740, "Wetland Riparian Area Protection and Management" (BLM 1979), as outlined in the Vegetation Element.

The applicable resource management approaches under the FLPMA state:

- "responding to national priority needs for resource use and development, both today and in the future, including such paramount priorities as energy development and transmission, without compromising the basic desert resources of soil, air, water, and vegetation, or public values such as wildlife, cultural resources, or magnificent desert scenery."

The Vegetation Plan Element of the CDCA Plan also addresses wetlands such as seeps and springs, riparian zones, and mesquite thickets, among others. Wetland-riparian areas, which constitute surface waters, are to be considered in all proposed land use actions where appropriate and legally possible. Steps are to be taken to ensure their unique characteristics and ecological requirements are managed in accordance with legislative, Executive, and

Secretarial directions. To the extent possible all actions are to avoid adverse impacts to wetland and riparian areas.

A key surface water resource in the vicinity of the HGLA is the Coso Hot Springs. Although located more than 10 miles east-southeast from the HGLA, the Coso Hot Springs are addressed in this analysis as a result of their high cultural importance and their listing on the National Register of Historic Places. The Coso Hot Springs are surface manifestations of the Coso geothermal reservoir, although any connection between the hot springs and the reservoir, if one exists, is complex.

The CDCA Water Resources Program requires the analysis of water resources impacts of various activities, including the collection of sufficient data to conduct adequate analysis and the formulation of recommendations for avoiding or mitigating impacts.

Groundwater

CDCA Plan Management goals for groundwater include:

- Comply with state and federal non-degradation policies, Clean Water Act, and wetland and riparian area protection guidelines.

- Areas designated in this class will be managed to minimize degradation of and enhance both surface and groundwater resources as specified in the CDCA Plan, except for instances of short-term degradation caused by water development projects.

4.6.1.2 *Impact Criteria*

Surface Water

The potential direct and indirect impacts of the Haiwee action alternatives on surface water resources are assessed with respect to the following impact criteria:

- Discharge of dredged or fill materials into waters of the United Sates, including wetlands;

- Decline of groundwater recharge functions of playa lakes, wetlands, and alluvial fans;

- Reduction of surface water available downstream to creeks, springs, wetlands, and Little Lake;

- Changes to the Coso Hot Springs;

- Violations of State Water Resources Control Board and Lahontan Regional Water Quality Control Board water quality standards and control measures;

- Impairment of beneficial uses of surface waters of the United States and State of California;

- Alteration or impairment of 100-year floodplains, or increase in the potential for flood risks;

- Increase of surface runoff from developed areas that would alter the hydrology of receiving waters;

- Erosion or sedimentation that would alter or impair the course of a perennial or intermittent stream, or substantially alter the area or capacity of a surface water feature; or

- Uses or facilities that would substantially degrade surface or groundwater quality.

Groundwater

The potential direct and indirect impacts of the Haiwee action alternatives on groundwater resources are assessed with respect to the following impact criteria:

- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level;

- Reduce well yield or increase pumping lift for existing groundwater users in Rose Valley;

- Decline in the productivity or capacity of the Coso geothermal reservoir;

- Violate State Water Resources Control Board and Lahontan Regional Water Quality Control Board groundwater quality standards and control measures;

- Reduce discharge rates or discharge water quality of springs in Rose Valley; or

- Reduce the quantity or quality of groundwater available to sustain lakes, ponds, wetlands, and riparian features at the Little Lake Ranch property at the south end of the valley.

The potential direct and indirect surface and groundwater impacts from geothermal resource exploration, development, utilization, and decommissioning/reclamation are classified as high, moderate or low intensity over the short- or long-term, as follows:

High
If there are significant impacts on the above criteria;

Moderate
If there are moderate impacts on the above criteria; or

Low
If there are minor to no measurable impacts on the above criteria.

4.6.2 Direct/Indirect Impacts

4.6.2.1 *General Impacts*

Surface Water

General surface water impacts from implementation of the Haiwee RFD scenario could include impacts to wetlands, groundwater recharge areas, surface waters like Little Lake, and floodplains. The HGLA is currently largely undeveloped. As such, new impervious surfaces such as roads, well pads and the various geothermal plant facilities would locally increase the volume of surface water runoff. This impact would be considered long-term since it would occur over the life of the facilities. Direct impacts to the playas within the HGLA could occur from the dredging or discharge of fill material for development of the geothermal plants and associated permanent access roads and transmission line structures. However, geothermal development and facilities would be sited to avoid these playas since they may represent important jurisdictional wetlands.

Direct impacts to the recharge functions of the playa lakes, wetlands, and alluvial fans in the HGLA and surrounding area could occur from filling or the development of such areas by impervious geothermal facilities and access roads. Impervious surfaces would prevent the percolation of runoff that provides groundwater recharge. However, it is expected that geothermal development and facilities would be sited to avoid these important groundwater recharge areas.

Although the source and amount of water required for development and operation of the Haiwee RFD scenario has not been identified, the public's concern for and limited availability of the existing groundwater resources in the HGLA make it unlikely that future projected water needs would come from groundwater extraction in the HGLA or Rose Valley (see below). Should Rose Valley groundwater be produced for project needs, each action alternative contains specific ground water use restrictions and requirements that limit impacts.

Increased groundwater extraction is unlikely to adversely impact the springs and surface water features in the Rose Valley except in the vicinity of Little Lake. Springs and surface water features in Rose Valley (e.g. Tunawee Canyon Spring, Davis Ranch Springs, Little Lake Canyon Springs) are generally located at higher elevations in the Sierra Nevada foothills on the uplifted side of the Sierra Nevada Fault Zone. Short-term or long-term groundwater withdrawals for the Haiwee RFD facilities would be unlikely to impact these springs because they are located well above the Rose Valley aquifer. In contrast to the Sierra Nevada springs, the surface waters and springs on the Little Lake Ranch property are particularly sensitive to changes in groundwater elevation and flow rates. The Little Lake surface waters and springs rely on groundwater discharge from within the Rose Valley for sustained flow. Analysis presented in the Hay Ranch Groundwater Extraction Project Draft EIR (MHA 2008) indicated that small changes in the groundwater flow rate towards the Little Lake area, or relatively small amounts of water table drawdown, could adversely impact surface water features on the Little Lake Ranch property. As a result, the Hay Ranch Water Extraction Project Hydrology Monitoring and Mitigation Plan (HMMP) specifies that the maximum reduction in groundwater flow rate from the Hay Ranch Groundwater Extraction Project, towards the Little Lake Ranch property be limited to less than 10 percent of current flow. The maximum groundwater table drawdown at the north end of the Little Lake Ranch property (at the Little Lake Ranch North well) is to be limited to less than 0.4 feet from current levels. These action thresholds were also adopted for the impact analysis presented below.

Finally, a 100-year floodplain area exists in the low lying areas of Rose Valley where runoff from the surrounding mountains is captured. This floodplain is considered a high flood risk area. Development of geothermal facilities in the floodplain could alter the functions of the floodplain, increase the potential for flood risks, and cause damage to geothermal facilities including the plants, roads, pipelines, and transmission line structures. As a result, geothermal development should be sited to avoid these flood prone areas.

Groundwater

As currently envisioned, the Haiwee RFD scenario will require water for well drilling, dust control during construction, and makeup water to compensate for evaporative loss during plant operation if the plant designs include conventional, i.e., "wet", cooling towers. The source for this water is currently unknown. However, based on the expressed public concern for, and limited availability of groundwater underneath the HGLA, the BLM has decided to prohibit or restrict by stipulation any groundwater extraction in the HGLA for consumptive use.

Water will be required for well drilling during geothermal exploration and development. Epsilon Systems Solutions, Inc. (Epsilon) estimated that each deep geothermal well drilled for the nearby Deep Rose Geothermal Project (Epsilon 2005) would require approximately 12 acre-ft of water. Epsilon (2005) estimated water requirements for dust control during drilling activities to be on the order of one acre-ft per well pad per well. An estimated total of 15 production wells and seven injection wells would be drilled over the course of the estimated 30 year lifespan of each power plant. A new production well is estimated to be needed every three years. One seven-acre well pad is required for every five wells. These values indicate a total need for drilling and dust control measures of approximately 300 acre-ft of water, or approximately 10 acre-ft of water per year for each 30 MW geothermal power plant throughout the typical 30-year project life. In addition, drilling of up to 20 temperature gradient wells for geothermal exploration purposes would also require water to prepare drilling fluids. Temperature gradient well drilling would probably require significantly less water than drilling production or injection wells; to conservatively assess potential impacts, a value of five acre-ft per well was assumed, indicating a total need for up to 100 acre-ft of water. These water needs are only necessary during the exploration and development phases, and not over the operational life of the geothermal plant facilities.

Haizlip (2010) estimated that the makeup water necessary to maintain fluid pressures in the geothermal reservoir would be up to approximately 1,450 gallons per minute (gpm), or as much as 2,340 acre-ft per year (ac-ft/yr) for a typical 30 MW dual flash geothermal power plant. The latter calculation assumes that 100% of the fluid lost during evaporative cooling of the geothermal fluid would be made up by the addition of water during reinjection of the condensate. Reinjection of less water than is produced from the geothermal reservoir would result in a gradual reduction in reservoir pressures and/or geothermal fluid yield and, as a consequence, result in a gradual reduction in the quantity of steam available to generate power. The rate of reduction in geothermal fluid availability is dependent on reservoir properties, the degree of development relative to the size and sustainable yield of the geothermal reservoir, and the rate of natural recharge of the geothermal reservoir. As these characteristics have not been determined for the HGLA, the amount of water needed to makeup reservoir losses was estimated from typical evaporative cooling loss rates in comparable dual flash geothermal power plants.

In contrast to the groundwater resources of the HGLA, those of the nearby Coso geothermal area have been more thoroughly studied. Several key dynamic criteria typically define the productive capacity of a geothermal reservoir. Likewise, these criteria can be affected by development of the geothermal reservoir itself or by development of nearby, hydrologically-connected thermal or non-thermal reservoirs. Production, injection or other subsurface activities of geothermal resource development of connected reservoirs or aquifers could cause reservoir pressure declines, reduction in liquid saturation, changes in cold water influx or other reservoir conditions. If these criteria are affected, then the productivity of the resource could be affected.

From recent geophysical and geochemical data the Coso geothermal reservoir does not connect hydrologically to the surrounding area because:

1) The Coso geophysical anomaly for the heat source (partially liquid magma) does not extend significantly northwest into the HGLA, indicating that the geothermal resources in the two areas have a different provenance (Lees 2002).

2) As the deep pressures in the Coso geothermal resource decline from brine extraction, deep or shallow ground waters do not replenish the geothermal reservoir fluids significantly (hence the need for the Hay Ranch Groundwater Extraction Hydrologic Monitoring and Mitigation Plan to increase recharge).

3) Geochemistry of the Coso geothermal fluids is distinct from the ground water chemistry of other ground waters elsewhere in the Coso Range (Christensen, et al. 2007).

4) Micro seismicity within the Coso geothermal field is related to fluid movement within the reservoir. This type of earth movement does not extend to the northwest into the HGLA where seismicity is dominated by movement along mapped faults. These different types of seismic activity indicate different systems of fractures (Bhappacharya, et al. 2002).

More importantly, because the Coso geothermal reservoir does not appear hydrologically connected to the surrounding areas, it may be possible that development of geothermal resources or groundwater resources in the vicinity of the HGLA will not affect the Coso geothermal reservoir, regardless of any development.

Groundwater use in Rose Valley consists of domestic drinking water supply, limited irrigation, light industrial processes and, at the south end of the valley, maintenance of riparian and wetland habitat in the Little Lake area. The Rose Valley aquifer is currently in a near steady-state, recharge to the valley is balanced by discharges. Any additional groundwater extraction could cause localized or more wide-spread draw downs in groundwater. Depending on groundwater extraction rates and proximity to sensitive features like Little Lake, water table drawdown could significantly impact the water available for residential use, irrigation, riparian and wetland habitat, and private wells. Pumping lift for private wells could also be increased, requiring increased energy consumption for ongoing groundwater extraction. Increased groundwater extraction could also indirectly impact groundwater quality. Although few data are available for the HGLA, deeper groundwater is believed to have higher Total Dissolved Solids (TDS) content than shallow groundwater. Increased groundwater extraction could create upward groundwater gradients. Consequences might be deeper, higher-TDS groundwater closer to the surface and potentially increased TDS in shallow groundwater. This impact could reduce suitability of groundwater for agricultural or drinking water uses.

Potential for Short-Term Impacts

Minor to no measurable impacts would be expected from groundwater extraction needs (estimated at 10 acre-ft/yr) for exploration, development, and dust control for the Haiwee RFD. Currently, truck load quantities of groundwater are extracted for dust control, irrigation, and light industrial activities (pumice mining) from wells near Coso Junction and the Little Lake Ranch property with no detectable impacts to groundwater quality or availability. A 14-day pumping test conducted on the Hay Ranch property in 2007 that produced a total of 88 acre-ft of groundwater had no detectable impact on groundwater quality and drawdown in wells located one mile or farther from the test well.

Potential for Long-Term Impacts

In contrast, moderate to high impacts to existing groundwater users in Rose Valley are expected if continuous groundwater extraction would be conducted to augment the geothermal reservoir fluids under the proposed action. Analysis presented in Appendix G indicated that long-term groundwater extraction from the local, near surface groundwater aquifer, to augment geothermal reservoir fluid levels would likely have significant long-term impacts on groundwater resources in Rose Valley. In particular, surface water features such as Little Lake at the south end of Rose Valley would likely be impacted. In addition, this analysis indicated that groundwater resource impacts from multiple groundwater development projects are likely to be additive. Groundwater extraction rates to offset the projected evaporative loss and loss via other processes were estimated to range up to 2,340 ac-ft/yr for a typical 30 MW geothermal plant, or 4,680 acre-ft/yr for the two geothermal plants projected under the Haiwee RFD scenario. For a typical 30-year geothermal project life, this makeup water extraction represents a significant use of local groundwater. Analysis presented in the Hay Ranch Groundwater Extraction Project Draft EIR (MHA, 2008) indicated that groundwater extraction for that project, at a proposed rate of 4,800 acre-ft/yr for 30 years, would have significant adverse effects on existing groundwater uses in Rose Valley, including a lowering of the local groundwater elevation and reduction of groundwater flow towards Little Lake. The Hay Ranch Groundwater Extraction Project is now up and running. The public has expressed concerns for significant impacts to the groundwater resources during a series of scoping meetings. Information from these meetings, along with these analyses, resulted in the BLM prohibiting or restricting groundwater extraction for consumptive uses at the HGLA.

A numerical groundwater flow model (Geologica 2010) was used to evaluate potential impacts of prolonged groundwater extraction to support the Haiwee RFD scenario (Appendix G). Simulations were conducted to evaluate the impacts to local groundwater resources from pumping the required makeup water quantities for the following scenarios:

a) 100% of the makeup water needed for a typical 30 MW geothermal plant (extracting 2,340 ac-ft/yr for 30 years);

b) 100% of the makeup water needed for two typical 30 MW geothermal plants (extracting 4,680 ac-ft/yr for 30 years); and

c) Long-term groundwater extraction at a reduced rate to augment geothermal reservoir fluid losses while minimizing potential impacts to critical sensitive receptors (mainly the surface water features on the Little Lake Ranch property).

Results of these evaluations indicated that withdrawal under either scenario A (2,340 ac-ft/yr for 30 years) or scenario B (4,680 ac-ft/yr for 30 years) could increase the depth to groundwater near existing water supply wells in the central portion and north end of Rose Valley. The effects of such pump rates could include increased pumping lift, higher energy costs, and potentially causing some shallower wells to go dry. Also, long-term pumping under either of these scenarios could cause a reduction in groundwater flow towards Little Lake Ranch that would exceed the 10% flow reduction threshold identified in the HMMP for the Hay Ranch project (MHA 2008). Under scenario C, the modeling analysis presented in Appendix G indicated that a long-term (30 year) steady pumping rate of approximately 715 gpm or 1,150 acre-feet/year could be sustained for 30 years without reducing groundwater flow towards Little Lake by more than 10 percent, provided that this was the only major groundwater extraction occurring in the valley (see Section 4.6.5 for discussion of potential cumulative effects).

In regards to the potential for impacts to the developed Coso geothermal resource area, the Coso geothermal reservoir does not appear to be hydrologically or otherwise connected to the surrounding area based on geophysical and geochemical data.

4.6.2.2 *Impacts by Alternative*

The BLM evaluated the anticipated and potential impacts to the water resources of the HGLA and surrounding areas under five alternative scenarios. Four of these alternatives represent action alternatives and require amending the current CDCA Plan. Three of these

(Alternative A, C, and D) also open some or all of the HGLA for leasing and the use of the HGLA's geothermal resources.

<u>Alternative A</u> – **Open the Entire HGLA for Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Exploration, Development and Leasing; Authorize All Pending Leases Within the HGLA**

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Groundwater extraction for consumptive use during exploration, development, and production would be allowed, but controlled or restricted by stipulation. Limited groundwater use may be allowed under certain conditions specified in Chapter 2 and in SA-HGLA-10. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to the water resources of the HGLA and surrounding areas that could be associated with Alternative A are discussed above in Section 4.6.2.1. Assuming that consumptive groundwater use does not occur during exploration and development, the foreseeable and potential impacts of Alternative A to the water resources of the HGLA and surrounding areas are expected to be minor, and largely limited to local changes in groundwater recharge or runoff patterns. Alternately, should consumptive water use occur under specified stipulations during geothermal exploration, development, and operations, impacts would be moderate. With regards to the potential impacts to the Coso Hot Springs, any effects to the hot springs from the proposed action are unlikely under Alternative A (or under any of the alternatives). This is due to the distance between the Coso Hot Springs and the HGLA, the likely discontinuity between geothermal resources between the two areas, and the observed isotopic differences in the waters. Moreover, surface manifestations in such hot springs reflect natural seasonal (and sometimes diurnal) variations (Geologica 2007).

With regard to surface water impacts, the specific locations of ground disturbing activities are not known; however, the acreage of disturbance would likely be spread out within the leasing area. Soil erosion and runoff from disturbed areas could potentially cause increased sedimentation and decrease in water quality in wetlands. However, due to infrequent precipitation in the area, absence of onsite or adjacent surface waters, and implementation of BMPs required under the NPDES General Permit and Inyo County's SWPPP, impacts to water quality are anticipated to be insignificant and not expected to be in violation of water quality standards or impairment of beneficial uses of wetlands. The potential for direct impacts to the floodplain would be low since geothermal development would be sited to avoid flood prone areas. The increase in impervious surface area would be minimal overall and the potential for impacts to hydrology would be low. In the event that future site-specific permitting studies would identify additional sensitive water resources that warrant protection or preservation, the BLM would stipulate appropriate, project-specific onsite mitigation measures.

Alternative B – Close the Entire HGLA to Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Closed and Unavailable for Geothermal Exploration, Development and Leasing; Deny Authorization of All Pending Leases Within the HGLA

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications.

Alternative B would not result in any impacts to the water resources of the HGLA or surrounding areas because no geothermal development would occur within the HGLA.

Alternative C – Open the HGLA to Geothermal Exploration, Development and Leasing; with No Surface Occupancy (NSO) Allowed in Sensitive Areas; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Leasing; Authorize All Pending Leases within the HGLA (Preferred Alternative)

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the HGLA under restrictions of the No Surface Occupancy (NSO) stipulation NSO-HGLA-1. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential water resource impacts associated with Alternative C would be generally similar to those for Alternative A, except that there would be no impacts related to consumptive water use at any time. Additionally, Alternative C allows for additional protection of specific hydrological features such as playas, wetlands, and floodplains, for example, via issuance of controlled surface use, or NSO restrictions, thereby giving a higher level of protection to such sensitive areas. The majority of known wetlands and ephemeral streams are located within the sensitive areas being protected. Similarly, the potential for direct impacts to floodplain areas would be low since sensitive resource areas include critical groundwater recharge areas that would be closed to surface disturbance.

The acreage of disturbance might be concentrated in a smaller area than under Alternative A, thus having a greater potential to impact erosion, sedimentation, and recharge, such areas could be protected by design restrictions. Moreover, there would be no increase in the potential for impervious surface area in comparison to the overall HGLA acreage, so the potential for impacts to the hydrology would be low.

As under Alternative A, any future geothermal development project under Alternative C would be required to comply with the corresponding surface and groundwater permit programs by Inyo County and the state. In addition, leases issued under Alternative C would be subject to other applicable existing laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form.

<u>Alternative D</u> – Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, 13,773 acres would be closed and the remaining acres would be open in this alternative. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

The closure of specific areas under Alternative D will not change the application of the RFD to the HGLA. The foreseeable and potential impacts to HGLA are generally similar to those of Alternative C, providing additional protection to important areas of the watershed. The potential for impacts, under Alternative D, would be reduced or eliminated within the sensitive resources area by the closure restrictions. The difference then, between alternatives, is that surface impacts are likely to be more spatially concentrated under Alternatives C and D, than in Alternative A. The foreseeable and potential impacts associated with Alternative D would be generally similar to those for Alternative C. Any future geothermal development project would be required to comply with the corresponding surface and groundwater permit programs by Inyo County and the state. In addition, leases issued under Alternative D would be subject to other applicable existing laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form.

Alternative E – No Action

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA. The three pending lease applications would be denied.

Alternative E would not result in any water resource impacts because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines.

4.7 BIOLOGICAL RESOURCES

4.7.1 Methodology

Environmental consequences to the biological resources of the Haiwee Geothermal Leasing Area (HGLA) and vicinity as a result of the Haiwee RFD scenario are described and evaluated in his section. This evaluation is based on typical disturbances associated with the various stages of geothermal development identified in the RFD. Any future specific geothermal development would be evaluated on a project specific basis and undergo full NEPA analysis and numerous state and local permitting studies. For this EIS, the program's potential impacts on vegetation, wildlife, and their habitats are qualitatively addressed.

4.7.1.1 *Management Goals*

The management goals of the CDCA Plan identify specific objectives to protect Mojave Desert vegetation communities and wildlife species. The following goals pertain to the HGLA.

Wildlife Management Goals

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

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

3. Manage those wildlife species on the federal and state lists of threatened and endangered species and their habitats so that 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 U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (CDFG).

4. Manage those wildlife species officially designated as sensitive by the BLM for California and their habitats so that the potential for federal or state listing is minimized.

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

Vegetation Management Goals

1. 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 the principles of sustained yield.

2. Manage those plant species on the federal and state lists of threatened and endangered species and their habitats so that 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.

3. Manage those plant species officially designated as sensitive by the BLM for California and their habitats so that the potential for federal or state listing is minimized. Include consideration of sensitive species habitats in all decisions such that impacts are avoided, mitigated, or compensated.

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

5. Accomplish the objectives of other resources by altering plant composition, density, and/or cover.

6. 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.

The HGLA is also within the designated Mojave Ground Squirrel Conservation Area, as identified in the West Mojave Plan. Currently the West Mojave Plan serves as the Habitat Management Plan for Mojave ground squirrel conservation on BLM-managed lands, as per the CDCA Plan (BLM 2000). The West Mojave Plan stipulates that permanent new ground disturbance within the Mojave Ground Squirrel Conservation Area be limited to one percent (1%) of existing habitat, or a total of 10,387 acres (BLM 2000).

The BLM manages the Mojave ground squirrel conservation land under the same provisions that apply in the Desert Wildlife Management Areas (DWMAs) as identified in the 1992 CDCA Memorandum of Understanding. The following measures identified for DWMAs include Tortoise Survey Areas and No Survey Areas that apply to the HGLA:

- Within DWMAs, presence-absence surveys and clearance surveys will be required. Tortoises should be moved from the immediate area of impact to adjacent suitable habitat (or burrow). In general, tortoises should be moved no further than 1,000 feet from the impact area. The potential for these animals to wander back into harm's way should be taken into account, and the distance given above modified by the authorized biologist, as necessary.

- Temporary or permanent fences may be needed to prevent tortoise immigration into the impact area.

4.7.1.2 Impact Criteria

The regulatory section of this EIS, (factors utilized to determine the relative importance of the biological resource in the vicinity of the Program) are, in part, based on species and habitats afforded protection under either the California Endangered Species Act (CESA), the federal Endangered Species Act (ESA), the West Mojave Plan or as having special status (e.g., Species of Concern, Sensitive Species, etc.) by the CDFG, USFWS, CNPS, or BLM.

Facility development or operation parameters that are inconsistent with the standards set by the regulatory agencies are considered significant impacts. Violation of the Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, and Executive Order 11990 – Protection of Wetlands, would also be considered a significant impact.

The selection of impact criteria and assessment of impact levels is based on the Haiwee RFD scenario, the corresponding resource sensitivity, and disturbance associated with each stage of geothermal development as well as the efficacy of the BMPs and other stipulations. There is potential to create both short-term construction-related impacts, and long-term or permanent displacement as a result of permanent habitat changes. Based on the specific type of impact, the potential impact levels have been categorized as either "High," "Moderate," or "Low."

Impact Levels

Impact levels were assigned to both wildlife and vegetation communities, and the individual classification criteria that correspond to these categories are listed in Appendix D. In brief, high levels of impacts include activities that would have direct and unavoidable impacts, and actions that would create a significant adverse change in present populations, individuals, or habitats. High impacts could potentially cause significant unavoidable harm, or stress to wildlife and/or vegetation. Stress is defined as actions that would potentially remove or destroy habitat, or displace or otherwise disturb the species.

Moderate impact levels occur when impacts affect the biota on a local versus regional level; involve only a moderate amount of unavoidable removal of vegetation, habitat, and indirect disturbance; or when they only marginally reduce habitat productivity. Moderate impacts can be expected to cause some stress to wildlife and/or vegetation.

Low levels of impacts are those that do not present a risk to the survival of local populations, or where appropriate BMPs can minimize or eliminate the intensity or duration of the impacts. Low level impacts cause little detectable stress to wildlife and/or vegetation.

4.7.2 Direct/Indirect Impacts

4.7.2.1 *General Impacts*

The general impacts of the Haiwee RFD scenario on vegetation, wildlife, special status species and important habitats and communities are summarized in Table 4.6-1. It should be noted that, prior to the onset of any disturbance, numerous design measures, and construction and operation procedures and policies would be established to avoid and minimize the potential impacts.

Vegetation

Activities such as site clearing and construction of geothermal facilities will affect the vegetation communities of the HGLA. Impacts to vegetation can include loss of native species and species diversity; increased risk of invasive species introduction; increased risk of topsoil erosion and seed bank depletion; increased risk of fire; creation of fugitive dust; and alteration of topography and drainage patterns.

Short-term impacts, such as crushing of vegetation by vehicles and equipment, is expected to occur during all development phases, and usually have limited lasting effects on vegetation. The potential for establishment of invasive plants can be increased when construction vehicles disturb or alter the structure of existing soils through compaction or excavation. Soil disturbance promotes the ability of non-native plants to compete with native plant species. Other impacts such as permanent removal of vegetation at the construction sites are considered long-term impacts.

Long-term impacts can occur from weed infestations that permanently alter plant species composition and communities. Surface disturbance creates a favorable environment, and use of construction equipment from outside area provides a transport means, for introducing non-native, invasive plant species to the Program area. Because site clearing typically removes the root systems and topsoil, such alterations can also result in the loss of native seed banks. With regard to operational impacts, accidental spills or releases of high-temperature steam or liquids could damage surrounding vegetation communities. Fugitive dust generated by construction activities and traffic has the potential to disperse into surrounding habitats and deposit onto foliage. Foliar deposition may reduce the overall vigor of individual plants by reducing their photosynthetic capabilities and increasing their susceptibility to pests or disease. Fugitive dust also may make plants unsuitable as habitat for insects and birds.

Table 4.6-1 Impact Summary to Biological Resources

Impact Type	Program Impact	Potential Impact and Biological Resource Effects	Impact Type and Longevity
Direct flora injury and/or mortality	Vehicle and human trampling during construction, operation and maintenance	Destruction, mortality, and injury to vegetation, reduction in habitat quantity and quality	Biological disturbance, change, and fragmentation. Long-term within the footprint from construction, access roads, and structures. Short-term in areas adjacent to drilling operations provided that restoration occurs.
Indirect plant injury and/or mortality	Soil compaction, spread of non-native species, deposition of dust and mud, soil erosion	Reduction in habitat quantity and quality, expansion of non-native species, reduction in plant vigor	Biological disturbance, change, and fragmentation. Short-term within the footprint from construction. Long-term for access roads.
Direct fauna injury and/or mortality	Vehicle and human trampling during construction, operation and maintenance	Destruction, mortality, and injury to wildlife species. Nest destruction. Fossorial species and species with limited mobility are most susceptible.	Biological change. Short-term within the footprint from construction, structures, and in areas adjacent to the geothermal plant. Long-term for access roads.
Indirect fauna injury and/or mortality	Vegetation removal, slope erosion, construction noise	Habitat quantity and quality reduction, habitat fragmentation, wildlife displacement	Biological disturbance, change, and fragmentation. Short-term within the footprint from construction. Long-term for access roads and/or vegetation maintenance.
Ground disturbance	Construction, well pads, geothermal plant, tower foundations, access roads	Habitat quantity and quality reduction, habitat fragmentation	Biological disturbance, change, and habitat fragmentation. Short-term within the temporary footprint from construction. Long-term from access roads, well pads, pipeline and geothermal plant location.

Impact Type	Program Impact	Potential Impact and Biological Resource Effects	Impact Type and Longevity
Fugitive dust generation	Construction, maintenance, and repair activities	Reduced photosynthesis, impaired species respiration, reduction in habitat quality	Biological disturbance and change. Short-term within the Program footprint from construction. Long-term from access roads and geothermal plant location.
Exposure to pollutants	Chemical spills from construction and maintenance	Reduce survival, population, and growth	Biological disturbance. Short-term, localized to construction and maintenance sites.
Noise, human presence	Construction, maintenance, and repair activities	Displace wildlife, disrupt breeding, migration, and foraging	Biological disturbance. Short-term within the footprint from construction. Long-term from access roads, well pads, and geothermal plant location.
Fire	Construction and maintenance equipment, human access	Habitat loss and reduction in habitat quality through the potential post-fire establishment of noxious weeds	Biological disturbance, change, fragmentation. Short-term in the construction footprint for the transmission line provided that restoration occurs. Long-term for access roads, well pads, pipeline and geothermal plant location.
Avian collisions	Conductors, shield wires, and guy-wires	Reduction in avian populations; waterfowl and upland game birds would be most susceptible	Biological disturbance. Long-term for transmission line right-of-way (ROW).
Increased predator habitat	Transmission towers	Raptors and corvids exploit perching opportunities, trash, and ponded water, resulting in increased predation on small mammal, tortoises and other bird species	Biological disturbance. Long-term for transmission line ROW.

Wildlife

Habitat loss

Construction activities will destroy a certain amount of wildlife habitat, and depending on the type of habitat, can have a moderate impact on species. Modification of habitat can alter complex interactions between species and their physical environment, resulting in shifts in the dynamic equilibrium among species, with some species declining while other increase in abundance. Geothermal exploration will affect 62 acres. The initial total surface disturbance required for the two geothermal plants would impact more than 200 acres before reclamation of some of these areas. Permanent loss of wildlife habitat removal would occur primarily at the well pads, generating plants, and access roads. The resulting impacts to wildlife would vary depending on the sensitivity of each species and whether sufficient habitat remained after development. Alteration of habitats, such as expected within the transmission line right-of-ways (ROWs), may introduce new species at the expense of "interior" species, thus changing local species composition. Fossorial species are harmed or killed through crushing of burrows. The noise, human presence, and traffic during construction activities can also alter or disrupt breeding and foraging habits, and cause displacement of species that would typically avoid such areas. The extent of such displacement would vary by species, and be partially dependent upon the type of construction activity as well as the duration and intensity. Displaced individuals could be jeopardized if adjacent habitats are already at carrying capacity or if only less suitable habitat is available.

Development of the Haiwee RFD scenario can result in fragmentation of existing habitats. Fragmentation occurs whenever a large continuous habitat is transformed into smaller patches that are separated from each other by either natural or human-induced factors. Developments such as transmission line ROWs can function as a barrier to dispersal for species associated with large tracts of habitat. Fragmentation results in many impacts to wildlife habitat. As the number of fragments increases in a given area, the core area size decreases, reducing the patches uninterrupted by human disturbance. The amount of edge area increases with the increase of fragments, and habitat connectivity decreases with increased fragmentation. Decreased connectivity may favor the habitat generalist wildlife species over the desert-adapted species, threatening species richness or diversity at regional scales (Rogers et al. 1996). Fragmentation by new roads can have a broader effect than just conversion of a small area of land to road surface. Construction of new roads typically increases ease of human access into relatively remote portions of the HGLA and may adversely affect wildlife species that are sensitive to noise or human activities.

Impacts from decommission activities would be similar in nature to impacts from construction, but of a reduced magnitude. Interim reclamation actions are anticipated to be completed no later than 6 months from when removal of the final well on the location has been completed. There would be temporary increases in noise and visual disturbance associated with the removal of the geothermal facilities and site reclamation. Dispersal of wildlife can occur due to noise, ground vibrations, general human presence associated with reclamation. Negligible to no reduction in wildlife habitat would be expected, and injury and mortality rates of vegetation and wildlife would be much lower than they would be during construction. Areas of temporary impacts would be returned to pre-existing contours and revegetated with a BLM-approved native plant species mix.

Impairment to Normal Behavior

The activities associated with the geothermal development are not expected to significantly impact or restrict wildlife movement. Movement of most Mojave Desert mammal and reptile species takes place at night, when most construction activities other than well drilling would be shut down. Short-term disruptions could occur during construction, with crews and construction activities acting as barriers to movement of wildlife.

Wildlife species are most vulnerable to construction-related disturbances during their breeding season. Disturbances from geothermal construction could result in nest, roost, or territory abandonment and subsequent reproductive failure if these disturbances were to occur during an affected species' breeding season. The season and timing of construction activities could potentially disrupt/disturb or negatively impact mating rituals and/or nesting, or breeding efforts and success, largely due to the high potential for dispersal if birds are scared off their nests from construction noise or presence of people and/or vehicles/equipment nearby. If birds are currently nesting and feel threatened by construction activities or human presence, they may abandon their nests, leaving the eggs or young behind. Nesting birds, their active nests, eggs, and chicks are protected under the Migratory Bird Treaty Act (MBTA). Destruction of an active nest would be a violation of the MBTA. Clearing of dense native vegetation or those areas supporting nesting birds during the nesting season is considered a significant impact. Disturbances from construction could result in nest, roost, or territory abandonment and subsequent reproductive failure if these disturbances were to occur during an affected species' breeding season.

Direct Mortality

The presence of a geothermal development and its associated access roads and ROWs may increase human use of surrounding areas, which in turn could impact wildlife in the surrounding areas through (1) Direct injury or mortality caused by crushing from heavy equipment, maintenance vehicles, or foot traffic; (2) increase in hunting (including poaching); and (3) increased potential for fire, especially in arid or semiarid areas. Individuals displaced from areas cleared of native vegetation for geothermal plants and well pads would be lost if adjacent habitats are at carrying capacity or if they are exposed to an increased risk of predation. Direct mortality of wildlife is anticipated to occur with geothermal development during habitat clearing, earthwork, grading, digging, and equipment movement. Deaths related to geothermal construction would be incurred primarily by burrow-dwelling animals, eggs and nestlings of bird species with small, well hidden nests (these must be avoided to prevent violation of the MBTA), and species with limited mobility (e.g., lizards, snakes, and ground squirrels). More mobile species like larger mammals (including American badger and kit fox) are expected to disperse into adjacent areas during the land clearing and grading phases associated geothermal construction. Indirect injury or mortality can also be caused by leaving micro trash on-site, such that wildlife may attempt to eat it or feed it to their young.

Terrestrial and avian species could be attracted to ponded water in the well pad sumps. The well pad sumps would store discharged geothermal fluid, runoff from the well pads, and accumulated rainwater. The temperature of the geothermal fluid when it is initially released would be extremely high and fatal to wildlife species. After release, the fluid would cool to ambient temperature. Once the fluid is cooled, the ponds would enhance habitat quality within the immediate area since water is a limiting factor to survival in desert environments. Protection measures such as netting may be required by BLM to deter wildlife from entering the sumps when hot fluids are present.

The Haiwee RFD would include an estimated four miles of new transmission line to connect each of the two geothermal plants with existing transmission lines or substations on the southwest portion of the HGLA. Transmission lines play an important role in concentrating raptor activity (BLM 1980). Raptors and other large aerial perching birds are most susceptible to electrocutions because of their size, distribution, and behavior (Olendorff et al. 1981, Avian Power Line Interaction Committee [APLIC] 2006, Sergio et al. 2005). Species frequently affected by electrocution particularly seem to involve birds of prey, ravens, and other large perching birds (Beavenger 1998). In addition, California spans a significant portion of the Pacific flyway, greatly increasing the number of seasonal transients. The electrical design factor most crucial in avian electrocutions is the physical separation between energized and/or grounded structures, conductors, hardware, or equipment that can be bridged by birds to complete a circuit (APLIC 2006). As a result of conductor and ground wire spacing, electrocution losses are typically less of an issue with high-voltage transmission lines such as those identified in the Haiwee RFD.

4.7.2.2 Impacts by Alternative

Alternative A: **Open the Entire HGLA for Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Open and**

Available for Geothermal Exploration, Development and Leasing; Authorize All Pending Leases Within the HGLA

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Groundwater extraction for consumptive use during exploration, development, and production would be allowed, but controlled or restricted by stipulation. Limited groundwater use may be allowed under certain conditions specified in Chapter 2 and in SA-HGLA-10. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres.

Impacts to biological resources are related to the Haiwee RFD actions (e.g., land disturbance, habitat destruction, erosion, changes in runoff patterns, and hydrological alterations), RFD action emissions (e.g., fugitive dust, sediment runoff, air releases, water releases), and resource use (e.g., water extraction). Many impacts can be reduced or avoided when considered during the siting and design phase. 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. Leasing of geothermal resources implies that ground disturbance activities associated with the development are likely to impact biological resources. For the purposes of analysis, anticipated development under the RFD for this alternative was assumed.

Vegetation

Total foreseeable surface disturbance for two new geothermal plants and its associated well pads, roads, and pipeline corridors is 384 acres of initial disturbance, and 276 acres long-term after reclamation. Impacts to vegetation include very slow recovery of plant cover, loss or change in native species populations, and reduced species diversity; increased risk of invasive species; increased risk of topsoil erosion and seed bank depletion; increased risk of fire; and alteration of water availability and seed dispersal. Not all vegetation communities listed below would be disturbed by the geothermal development. However, the degradation of native plant communities from geothermal development could contribute to the decline of listed species or their habitat. Table 2-1 and Table 2-2, in Chapter 2, describe the acreage potentially impacted by geothermal leasing.

Vegetation resources could be directly and indirectly affected by construction, operation and maintenance activities. Various phases of construction would occur simultaneously at different locations throughout the construction process. This would require several construction crews operating in these different locations. Impacts to these vegetation communities are potentially adverse and would require mitigation. Impacts to ruderal and disturbed vegetation and developed land are considered to be minimal and do not require mitigation.

Non-native plant species

Introduction of non-native plant species would occur primarily during construction, and could continue to occur during the operation and maintenance phase of the possible RFD actions. Vehicles moved from other areas supporting non-native or invasive species could introduce non-native or invasive plants by transporting seeds that may be clinging to vehicle structures or that have been incorporated into soil adhering to the vehicle. In addition, the potential for establishment of invasive plants could be increased when construction vehicles alter the structure of existing soils through compaction or excavation, which alters the ability of native plants to compete with introduced plant species. The introduction or spread of non-native plant species would result in adverse impacts without mitigation.

The introduction of noxious weeds can have direct or indirect long-term effects on wildlife and wildlife habitat, and special-status plants and animals in more mesic environments, including stream channels, burned areas, and eroded slopes. Noxious plant species are largely confined to road edges, newly graded areas, and other areas where existing vegetation is crushed and soils are impacted. Potential impacts associated with noxious weed introduction and spread would be minimized through the implementation of mitigation measures.

Wetlands / Drainage

The paleo-Owens River is central to the Rose Valley drainage, encompassing the lower elevations along the western side of the HGLA. There are two man-made permanently flooded lakes at the north end of Rose Valley, but not within the HGLA: the North Haiwee Reservoir and the South Haiwee Reservoir. Little Lake, at the south end of Rose Valley, also not within the HGLA, is a shallow naturally formed lake that has controlled outflow. There are various types of wetlands associated with the edges of these water bodies, especially around the outflow areas. The most notable wetland that is within the designated HGLA is a playa lake in the southwest corner of the Haiwee area. It is part of the overall surface drainage of the Rose Valley. Playa lakes are shallow, unvegetated, intermittent lakes exceeding 20 acres in size that contain water during the wet season and dry up with the absence of rainfall. They are located on flat areas at the lowest part of an undrained desert basin. Surface water resources that may occur within possible RFD actions include desert washes and other streams, the majority of which are ephemeral. Most of these watercourses would be avoided or spanned by the transmission lines. Impacts to wetlands would still occur, for example, where an access road would cross a water course or construction would result in temporary removal or disturbance of riparian vegetation. Impacts to wetlands are major but may be mitigated with the implementation of the Mitigation Measures listed in

Appendix A. Given the proposed water stipulation, SA-HGLA-10, it is unlikely that RFD water use, overall, would have more than a minor impact to wetlands.

Wildlife
Clearing and grading would generate the greatest construction impacts on wildlife, especially in undisturbed portions of BLM-managed land. Noise, dust, visual disturbance from increased human activity, and exhaust emissions from heavy equipment during geothermal construction could result in native habitats adjacent to the construction zone being temporarily unattractive to wildlife. In addition, access roads would create a long-term impact by fragmenting habitat and increasing human access.

Special-Status Species

Special Status Plants
Six special-status plant species have a high potential to occur in the HGLA, including the Darwin Mesa milkvetch, Booth's evening primrose, Kern Canyon clarkia, Amargosa beardtongue, Charlotte's phacelia, and Owens Valley checkerbloom. Refer to Chapter 3 for additional special-status plant species with a moderate to low potential to occur. Geothermal development would potentially result in direct impacts related to removal, burial, or destruction of habitat for these species. Disturbance to plants can also be an indirect impact of geothermal development, as dust or mud deposition may occur during construction, but may not have lasting effects until later, when plant vigor can be reduced due to a drop in photosynthesis. Ground-disturbance activity, including geothermal plant construction and grading of access roads, has the potential to disturb listed plant species. Although the potential for an increase in the spread of invasive and noxious weeds would occur during the construction phase due to increasing traffic and human activity, the potential impacts could be partially reduced by interim reclamation and implementation of BMPs.

Desert Tortoise
The desert tortoise (*Gopherus agassizii*) is a State and Federal Threatened species. The Mojave population of the desert tortoise was listed under the ESA of 1973, as amended, in 1990 (55 FR 12178 12191) and under the CESA. The desert tortoise requires sufficient suitable plants for forage and cover, and suitable substrates for burrows and nest sites. The desert tortoise is threatened by off-road vehicles, livestock grazing, and mining. Disease related to human-caused stress is also taking a heavy toll on the desert tortoise (Berry 2008). This species is present in the northern section of the proposed HGLA. No critical habitat for this species is present within Alternative A. Any direct or indirect impact to the desert tortoise or its occupied habitat (e.g., vehicle crushing a tortoise, habitat removal) from construction would have a substantial adverse effect on one or more individuals of a species that is federal- or state-listed by habitat modification. As the HGLA could affect the species or habitat utilized by the desert tortoise, the BLM will undertake Section 7 consultation,

under the ESA, with USFWS prior to publication of the Final EIS. The findings and mitigation measures required by the USFWS with respect to the desert tortoise would be integrated into RFD action requirements of any alternative that opens the area to leasing and is approved by the BLM (Alternative A, B, or D). Subsequent consultation may be required for any ground disturbing activities that may be proposed.

Mojave Ground Squirrel

The Mojave ground squirrel (*Spermophilus Mojavens*is) is listed as "Threatened" by the State of California (CDFG 2009). Alternative B provides the majority of potential habitat for this species when compared to the other alternatives and has known occurrence records.

Alternative A is within the designated Mojave Ground Squirrel Conservation Area, as identified in the West Mojave Plan. Currently, the West Mojave Plan serves as the Habitat Management Plan for Mojave ground squirrel conservation on BLM-managed lands, as per the CDCA Plan (BLM 2000). There will be several effects from the proposed action on this species, including habitat loss from construction of the geothermal plant, pipeline, well pads, new access roads and transmission lines. Direct mortality or injury can occur if undetected active burrows are crushed by heavy equipment, displacement due to construction noise or vibrations, decreased food availability, and increased predation risk due to loss of vegetation cover. Controlled Surface Use Stipulation CSU-HGLA-1 may be implemented to minimize project impacts to the Mojave ground squirrel. To reduce these potential impacts to this species a lease applicant shall fund, or share in the private-sector funding of, protocol level surveys for Mojave ground squirrel occupancy. The surveys shall follow protocol acceptable to the CDFG and BLM and shall include suitable habitat within the HGLA. If Mojave ground squirrels are detected, the lease Applicant shall consult with BLM and CDFG to establish additional on-site measures to protect the areas occupied by the Mojave ground squirrel.

Burrowing Owl

Although the burrowing owl is not federal- or-state listed, the CDFG requires surveys and mitigation for this declining species, which it considers a Species of Special Concern. Potential habitat and known occurrences have been documented for this species within Alternative A. Direct impacts to this species could occur from the removal of active burrows and direct mortality of owls during Program activities. Indirect impacts could occur from increased noise, lighting, and dust during construction. Although this species is not currently listed by federal agencies, it is a state species of special concern and impacts to this species would be major because the CDFG (Assembly Bill 3180) requires mitigation measures for this species according to currently accepted protocols. As outlined in Appendix A, preconstruction surveys shall be performed in accordance with the accepted CDFG Burrowing Owl Guidelines.

Raptors

Seven special-status raptor species have the potential to occur in the HGLA. Some of these species include golden eagle, northern goshawk, and Swainson's hawk. Given the rugged topography, the well pads and geothermal plants will be located in flatter areas, whereas the raptor species tend to nest in surrounding cliffs. These species are likely to forage within the construction area but unlikely to nest within the potential well pad and geothermal plant sites.

The bald eagle and golden eagle are very sensitive to human activity, especially in the vicinity of nesting area(s), and even distant construction activity (or maintenance activity) could cause abandonment of a nest, subsequent failure, and continuing decline of the species. Human activity within 660 feet of a nest site is considered major and not mitigable, especially if there is direct line-of-sight between the nest site and the human activity, or if the human activity occurs above the nest site in elevation (USFWS 2007). Exceptions to this are if the activity within 660 feet of the nest site (without direct line-of-sight and activity is below the nest site) occurs where there is already an existing disturbance, such as a highly utilized road or utility corridor with existing large structures, or if the RFD action is underground.

Where human activity agitates or bothers roosting or foraging eagles to the degree that causes injury or substantially interferes with breeding, feeding, or sheltering behavior and causes, or is likely to cause, a loss of productivity or nest abandonment, the conduct of the activity constitutes a violation of the Eagle Act's prohibition against disturbing eagles (USFWS 2007). Because these raptor species are not likely to nest on site, and because these species are highly mobile, construction and operation activities are not expected to directly impact raptor species.

Bats

Numerous sensitive bat species have the potential to occur in the rugged terrain surrounding open water sources such as springs, ponds, and water holes. A bat biologist has not investigated the nearby Beebe, Jack Henry, Five Tunnels, and McCloud mines for resident bat colonies. Some of these include the pallid bat and Townsend's Big-Eared bat. Construction activities may have an impact on sensitive bat species if well pads and geothermal plants are located near rocky cliffs. Geothermal resource leases are subject to standard stipulations and lease terms, and include surveys for special-status mammal species. If present, roosting colonies should be flagged and protected by restricting construction activities within 200 feet of roosting locations at dusk when bats leave the roost and at dawn when bats return to the roost. Bats emit species-specific sound frequencies for echolocation. Secondary impacts, such as noise and dust, would be reduced through the implementation of BMPs.

Terrestrial mammals

The American badger and kit fox have the potential to occur in the study area. It is possible that the RFD actions may have short-term indirect effects on these mammal species during construction of the new transmission line. Indirect impacts could also occur from clearing and grading for geothermal plant, well pad and pipeline. The removal of vegetation from these areas could result in the loss of forage and cover for these species. Through the implementation of BMPs, RFD actions activities may affect, but are not likely to adversely affect, populations of these species, if present.

Loggerhead Shrike

Loggerhead shrike (*Lanius ludovicianus*) is listed as a CDFG Species of Special Concern and Fish and Wildlife Service Bird of Conservation Concern. Their range in California extends throughout most of the state except for the northwest. Habitats typically occupied by loggerhead shrike include those possessing open space with patchily distributed trees or shrubs. Deserts possessing spiny shrubs and scrubby vegetation as well as pastoral, agricultural, or suburban settings are frequently occupied (Yousef 1996). Nests will usually be constructed in isolated trees or large shrubs within the occupied habitat. Pairs in California remain together year-round and defend their territories from other individuals of their kind. They typically nest earlier than most other passerines, perhaps as a result of their year-round association with mates (Yousef 1996).This bird species preys mainly on arthropods, reptiles, small mammals and other birds. Another common name of this species is "butcher bird" as they are known to store their prey on thorns and barbed wire.

Based on reported sightings and availability of suitable habitat, this species is expected to have a potential to occur within the Alternative A. Surface disturbance such as clearing for the geothermal plant, pipeline, grading of new or existing access roads would result in habitat and vegetation loss. This would cause habitat degradation which may make the area less appealing to loggerhead shrike individuals. It is expected that preconstruction surveys and/or biological monitoring will locate any nests within shrubs or trees in the area, although if any nests are not located, this could result in injury or mortality of individuals. Construction noise and human presence may cause birds to disperse from the area, potentially abandoning a nest if any birds are nesting nearby during construction. Effects from Alternative A will be minimized by the implementation of BMPs.

Northern sagebrush lizard

The Northern sagebrush lizard has the potential to occur within Alternative A. As temperatures rise, the lizard will appear to escape extreme daytime temperatures by retreating to burrows. They forage and are most active during the morning and evening. During the active season, the lizards spend the night below the sand, on the surface, or in burrows.

Potential impacts to these species include habitat loss leading to a reduction in local species range or dispersal to adjacent, less-suitable habits; disturbance of general foraging or breeding behavior; and mortality during construction through crushing, grading, or burying that may be required for tower site preparation or construction. Individuals may also become scared of construction activity, noise, and/or vibrations and vacate the area, forcing them to temporarily move to areas which they may be unfamiliar with or which may be unsuitable habitat for them. This may also lead to increased competition or predation from wildlife in adjacent habitats. However, this is a short-term impact, as it is expected that individuals would begin moving back to their native habitat shortly after construction leaves the area or after the area has become at least partially restored through revegetation.

Alternative B – Close the Entire HGLA to Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Closed and Unavailable for Geothermal Exploration, Development and Leasing; Deny Authorization of All Pending Leases Within the HGLA

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications. Impacts to all resources would occur as if the proposed action had not been contemplated and the HGLA would not be open to geothermal leasing.

Selecting Alternative B would not facilitate the leasing process for geothermal resources within the HGLA, and would not meet the stated purpose and need to implement Executive Order 13212 as well as the directives of the Energy Policy Act of 2005. Alternative B would not facilitate the processing of the three pending lease applications, nor facilitate analysis of the area's geothermal resource potential. Finally, Alternative B would not assist the State of California in meeting its Renewable Portfolio Standard Goals.

However, throughout the western section of HGLA, ongoing maintenance of the existing transmission lines would continue to occur. This includes complying with regulations governing operation of transmission lines such as maintaining access and spur roads, and vegetation trimming to maintain minimum clearance distances to the conductors and around towers. In addition, several off-highway vehicle (OHV) roads occur within the BLM-managed land increasing human access and utilization of the land. In the absence of the RFD actions or alternatives, biological resources will likely be impacted with continued maintenance and operation of the existing transmission lines and OHV use.

Alternative C: Open the HGLA to Geothermal Exploration, Development and Leasing; with No Surface Occupancy (NSO) Allowed in Sensitive Areas; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Leasing; Authorize All Pending Leases within the HGLA

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the HGLA under restrictions of the No Surface Occupancy (NSO) stipulation NSO-HGLA-1. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to the biological resources of the HGLA under Alternative C would be generally similar as those for Alternative A in terms of long-term total acreage losses of vegetation and wildlife habitat. However, Alternative C would provide additional control over surface occupancy in core habitats occupied by sensitive or special-status plant and animal species, including core habitat for the Mojave ground squirrel, desert tortoise, burrowing owl, and northern sagebrush lizard. Potential impacts to vegetation communities and wildlife in areas adjacent to exploration and construction areas would be controlled by the appropriate BMPs and impact mitigation measures and, similar to Alternative A, all phases of geothermal exploration, development, and operation under Alternative C would also comply with all applicable laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form.

Alternative D: Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have Designated Areas within the HGLA Open and Available for Geothermal Leasing; Amend the CDCA Plan to have Designated Areas within the HGLA Closed and Unavailable for Geothermal Leasing; Authorize All Pending Leases Within the HGLA

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, 13,773 acres would be closed and the remaining acres would be open in this alternative. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to the biological resources of the HGLA under Alternative D would be generally similar as those for Alternatives A and C in terms of long-term acreage of vegetation and wildlife habitat losses. However, Alternative D would allow the BLM to close areas of the HGLA considered core habitats to sensitive or special-status plant and animal species. This would provide additional protection to those sensitive resources. Potential impacts to vegetation communities and wildlife in areas adjacent to exploration and construction areas would be controlled by the appropriate BMPs and impact mitigation measures. All phases of geothermal exploration, development, and operation under Alternative D would also comply with all applicable laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form.

Alternative E: No Action

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA.

The three pending lease applications would be denied based on the analysis and future lease applications in the HGLA would require detailed NEPA analysis and subsequent CDCA Plan amendments. The potential for ground-disturbing activities would exist without consistently developed guidelines, restrictions, and stipulations. Alternative E, however, would not result in any adverse impacts because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines.
Taking no action would not facilitate the leasing process for geothermal resources and would not meet the stated purpose and need to implement Executive Order 13212 and the Energy Policy Act. However, it is analyzed in detail to provide a baseline from which to evaluate the other alternatives in accordance with CEQ guidance. For the purposes of the impact analysis and alternative comparison, anticipated development under the RFD was assumed to not occur for this alternative.

4.8 CULTURAL RESOURCES

4.8.1 Methodology

4.8.1.1 *Management Goals*

The CDCA Plan's management goals addressing cultural resources include:

- 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 (Natural Register quality) cultural resources where adverse impacts cannot be avoided.

The corresponding Multiple-Use Class L guidelines for cultural resources state:

- Archaeological values will be preserved and protected. Procedures described in 36 CFR 800 will be observed where applicable.

Proposed leasing actions that would result from alternatives under consideration would also be subject to stipulations and best management practices as provided in the *Record of Decision and Resource Management Plan Amendments for Geothermal Leasing in the Western United States* (December 2008) and its associated *Final Programmatic Environmental Impact Statement* (October 2008) (Western Geothermal PEIS). The conditions of the Western Geothermal PEIS are incorporated by reference, but are restated or summarized here where it is specific to the management of cultural resources in the HGLA.

The Western Geothermal PEIS provides for the imposition of No Surface Occupancy (NSO) stipulations to protect significant historic properties or cultural values. The impositions of the NSO stipulations are considered a major constraint as they do not allow for surface development. For example, a lessee of a NSO area must develop any surface infrastructure outside the NSO area and would need to use advanced technology, such as directional drilling, to access the geothermal resource under the NSO area. These NSO stipulations would be applied to the standard lease form as condition of the lease. An NSO is appropriate when the standard terms and conditions, other less restrictive lease stipulations (see below), and best management practices for permit approval are determined to be insufficient to achieve the resource protection objectives. An NSO would be considered a reasonable and appropriate management measure to achieve avoidance within the boundary of properties designated or eligible for the National Register of Historic Places, including National Landmarks and National Register Districts and Sites, for additional lands outside the designated boundaries to the extent necessary to protect values where the setting and integrity is critical to their designation or eligibility, and for areas with important cultural and archaeological resources, such as traditional cultural properties and Native American sacred sites, as identified through consultation.

In addition, as stated in the Western Geothermal PEIS and BLM Instruction Memorandum No. 2005-003, the BLM requires the following stipulation to protect cultural resources be made part of any leasing decision:

> "This lease may be found to contain historic properties and/or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, E.O. 13007, or other statutes and executive orders. The BLM will not approve any ground disturbing activities that may affect any such properties or resources until it completes its obligations under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated."

The BLM's foremost management goal for cultural resources is avoidance of adverse impacts where possible. The BLM may approve exploration or development proposals with conditions that avoid cultural resources that have been determined eligible or are considered potentially eligible to the NRHP, or not authorize an activity likely to result in adverse effects to significant values that cannot be successfully avoided, minimized, or mitigated. Avoidance measures could include moving development elements away from known cultural resources or sensitive areas, encouraging development in previously disturbed areas, or restricting travel to existing roads. Any cultural resource field investigations required by the BLM would be coordinated with consultation with Indian tribes where appropriate and issuance of a Cultural Resource Use Permit (CRUP) under FLPMA.

Consistent with the 36 CFR Part 800 and as described in the Western Geothermal PEIS, before any specific permits are issued under leases, treatment of cultural resources will 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 will 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 NRHP. Those sites not already evaluated for NRHP eligibility will be evaluated based on surface remains, subsurface testing, archival, and/or ethnographic sources. Subsurface testing will 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 will be submitted to the BLM, and a treatment plan will be prepared to detail methods for avoidance of impacts or mitigation of effects. The BLM will make determinations of eligibility and effect and consult with SHPO as necessary based on each proposed lease application and project plans. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated. Avoidance of impacts through project design will 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 consistent with 36 CFR Part 800 and proceeded 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.

4.8.1.2 *Impact Criteria*

Where adverse effects to the significant values of cultural resources cannot be avoided, the BLM would comply with Section 106 of the NRHP and its implementing regulations at 36 CFR Part 800. Section 106 requires the BLM to take into account the effects of the proposed federal action on historic properties, which are cultural resources that have been determined eligible or are listed on the NRHP. To be determined eligible for listing on the NRHP, cultural resources must meet one or more of the following four criteria established by the Secretary of the Interior in 36 CFR 60.4:

A. are associated with events that have made a significant contribution to the broad patterns of history;

B. are associated with the lives of persons significant in the past;

C. embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction; or

D. have yielded, or may be likely to yield, information important in prehistory or history

A cultural resource that is eligible for listing on the NRHP is referred to as a "historic property" according to the regulations regardless of the time period to which it dates. Also, to be listed in, or determined eligible for, the NRHP a cultural resource must possess integrity. Integrity is defined as the authenticity of a cultural resource's identity as evidenced by the survival of physical characteristics that existed during the prehistoric or historic period of use. The NRHP recognizes seven aspects that in various combinations define integrity: location, design, setting, materials, workmanship, feeling, and association. Integrity of location means that the cultural resource has not been moved from its historical location. Integrity of design, materials, and workmanship means that an architectural resource's original building materials, plan, shape, and design elements remain intact. Integrity of setting means the surrounding landscape has changed very little since the period of importance for the resource. Integrity of feeling and association means the cultural resource retains a link to an earlier time and place and is able to evoke that era.

Historic properties must generally be at least 50 years old; however, certain cultural resources associated with more recent, exceptionally important events (e.g., the development of nuclear energy; space exploration) may also be considered eligible to the NRHP.

A proposed federal action, or project, may affect a significant (i.e., NRHP-eligible) historic property when it alters the property's characteristics or values, including relevant features of its environment or use, that qualify it as significant according to NRHP criteria.

Because of limited survey, we can assume that there remain many cultural resources, primarily archaeological sites, in the HGLA that remain to be identified, recorded and evaluated for NRHP eligibility. Of the 218 known and recorded cultural resources in the HGLA, most have never been subject to NRHP evaluation.

4.8.2 Direct/Indirect Impacts

4.8.2.1 *General Impacts*

The impact levels for the cultural resource impact assessment are defined as follows:

Adverse

An adverse level of impact to cultural resources would result if the short term activities of exploration drilling, seismic testing, and construction, or the long term operation, or maintenance of the wells, geothermal plants, and possible transmission lines authorized by leasing decisions in this plan would result in identifiable and unavoidable direct, indirect or cumulative impacts to the significant qualities and values or characteristics and use of cultural resources that are historic properties (e.g., listed in or eligible to the NRHP).

Major

A major impact to cultural resources would result if the exploration drilling and seismic testing or the construction, operation, or maintenance of the proposed project has a high likelihood of causing ground disturbance or other unavoidable changes to the condition of cultural resources (e.g., cultural resources not yet evaluated for NRHP eligibility) or unsurveyed land defined as highly sensitive for containing cultural resources. Major impacts would have a high likelihood of also occurring where construction, operation, or maintenance of the wells, geothermal plants, or possible transmission lines would result in substantial ground disturbance or other changes at or near resources or land defined as high sensitivity. Major impacts would assume that direct, indirect, or cumulative impacts are not identifiable or quantifiable at the planning level, but if a historic property were identified as a result of a leasing action that there is a high likelihood that the impact could not be avoided or minimized, but that the impacts could be mitigated through the imposition of the stipulations and best management practices described above.

Moderate

A moderate impact to cultural resources would result if the exploration drilling and seismic testing or the construction, operation, or maintenance of the proposed project has a moderate likelihood of causing ground disturbance or other adverse change to the condition of cultural resources (e.g., cultural resources not yet evaluated for NRHP eligibility) or unsurveyed land defined as moderately sensitive for containing cultural resources. Impacts would have a moderate likelihood of also occurring where construction, operation, or maintenance of the wells, geothermal plants, or possible transmission lines would result in moderate ground disturbance or other adverse change at or near resources or land defined as moderate sensitivity. Moderate impacts would assume that direct, indirect, or cumulative impacts are not identifiable or quantifiable at the planning level, but if a historic property were identified as a result of a leasing action that there is a moderate likelihood that the impact could not be avoided, but effects could be minimized or mitigated through the imposition of the stipulations and best management practices described above .

Minor

A minor impact to cultural resources would result if the construction, operation, or maintenance of the proposed project would potentially cause any amount of ground disturbance or other adverse changes to cultural resources or lands defined as having low sensitivity and likely to result in a no historic properties finding under Section

106 of the NHPA (e.g., cultural resources determined to be not eligible to the NRHP; land previously surveyed intensively for cultural resources and where no cultural resources were identified). Some previously surveyed areas with no visible cultural resources could still potentially contain buried archaeological sites that are not visible on the surface. Minor would assume that direct, indirect, or cumulative impacts are not identifiable or quantifiable at the planning level, but if a historic property were identified as a result of a leasing action that there is a high likelihood that the impact could be avoided, minimized or mitigated through the imposition of the stipulations and best management practices described above.

Negligible

A negligible impact to cultural resources would result if the construction, operation, or maintenance of the proposed project would potentially cause any amount of ground disturbance or other adverse changes to cultural resources or lands defined as having low sensitivity (e.g., cultural resources determined to be not eligible to the NRHP; land previously surveyed intensively for cultural resources and where no cultural resources were identified). Some previously surveyed areas with no visible cultural resources could still potentially contain buried archaeological sites that are not visible on the surface. Negligible impacts would assume that direct, indirect, or cumulative impacts are not identifiable or quantifiable at the planning level, but if a historic property were identified as a result of a leasing action that there is a high likelihood that the impact could be avoided through the imposition of the stipulations and best management practices described above.

No Identifiable Impact

No identifiable impact would be indicated where no identifiable, measurable or suspected adverse impact would occur to known and recorded cultural resources. These areas would include only those lands where past disturbance, either human-caused or natural, precludes any possibility of containing intact cultural resources.

Geothermal exploration and construction projects (e.g., exploration drilling, seismic testing, well drilling, clearing, grading, earth moving, construction of geothermal plants, off-road vehicle use) have the potential to impact cultural resources, especially archaeological sites whose significant values are most often scientific and informational. Impacts are direct and most obvious whenever the ground surface is disturbed. Ground disturbance destroys the spatial context of archaeological sites and, unless preceded by proper archaeological excavation and analysis, limits the scientific and informational value of the material remains of a site. Impacts to archaeological sites that are visible on the surface are identifiable through survey and evaluation, and pre-approval management prescriptions can be developed to avoid, minimize or mitigate impacts to significant resource values. However, archaeological resources with no visible surface component may exist in any previously undisturbed area and may be encountered inadvertently during exploration or construction activities.

Seismic testing can be either passive, which causes little ground disturbance, or induced, which typically requires the drilling of holes less than 100 feet deep for the placement of explosives or seismic monitoring devices. Preparation of the construction site and grading of access roads can also impact cultural resources. Ground clearing can compact soils, crush artifacts, and alter prehistoric and historic features. Although some construction activities are temporary, impacts to cultural resources resulting from these activities may be permanent.

Geothermal projects may also have direct impacts on architectural resources, such as buildings, bridges, roads, and other elements of the built environment, by requiring the removal or modification of these features. Architectural resources most often are significant for their associative values (Criteria A-C of the NRHP). Direct impacts to architectural or built-environment resources are identifiable through survey and evaluation, and pre-approval management prescriptions can be developed in advance to avoid, minimize or mitigate impacts to significant resource values.

Geothermal project activities may result in the introduction of access-related impacts to cultural resources by improving existing roads or creating new roads into a previously remote area, thereby increasing pedestrian and vehicle traffic. The likelihood of unauthorized collection of artifacts and intentional, as well as inadvertent, destruction of structures or features increases with ease of access. Impacts resulting from increased access would be predictable and identifiable through survey and evaluation of archaeological sites, and pre-approval management prescriptions can be developed in advance to avoid, minimize or mitigate impacts to significant resource values.

Indirect impacts can generally be described to result from the introduction of visual, auditory, or atmospheric elements is such a way to affect the significant qualities or values of a historic property or its historic setting or context. The most common indirect effect to historic properties results from the introduction of new visual elements in the historic setting of a historic property. For instance, an adverse effect could occur with introduction of a transmission tower or power plant into the historic setting of a historic building. Auditory effects result from the introduction of noise in such a way as to affect the significant values, characteristics and use of a historic property or its setting. Short term effects could result from construction noise or seismic exploration. Long term effects include increased or on-going noise from trucks or power generation. Atmospheric effects result from the introduction of new elements, such as increased dust from construction, dust suppression chemicals, oil or drilling fluid spills, or man-made water erosion in such a way as to affect the significant qualities, characteristics or use of a historic property or its historic setting.

The introduction of visual, auditory, or atmospheric elements does not automatically result in an adverse effect. The type of intrusion must be considered within in the context significance qualities and values of the historic property. As an example, constructing a transmission tower in the visual and auditory vicinity of an archaeological site would likely have no effect on the significant information values of the site. Indirect impacts resulting from the introduction of visual, auditory, or atmospheric elements in such a way as to affect the significant values, characteristics and use of a historic property or its setting should be identifiable through survey and evaluation, and pre-approval management prescriptions can be developed in advance to avoid, minimize or mitigate impacts to significant resource values.

4.8.2.2 *Impacts by Alternative*

<u>Alternative A</u> – **Open the Entire HGLA for Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Exploration, Development and Leasing; Authorize All Pending Leases Within the HGLA**

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres. The reasonably foreseeable development of HGLA's geothermal resources under Alternative A would result in the clearing and grading of an estimated 384 acres, or 1.7% of the planning area, for well sites, well fields, the geothermal generating facilities, and associated infra-structure. Through project planning and imposition of stipulations and best management practices, adverse effects would be avoided and any impacts to the significant values of cultural resources are expected to be minor. Alternative A would not change BLM's existing management goals under the CDCA plan for cultural resources within the planning area.

The foreseeable and potential impacts to cultural resources under Alternative A are discussed in the previous section. Under Alternative A impacts to such resources would be avoided or minimized by implementing the stipulations and best management practices described in the Western Geothermal PEIS, as well as BLM cultural resources policy and guidance. This would occur via a pre-exploration and pre-construction cultural resources survey of RFD impact areas to identify their locations and significance, and stipulating appropriate, project-specific avoidance, minimization, or mitigation measures. Before any specific leases for geothermal exploration or development can be granted by the BLM, treatment of cultural resources would follow the procedures established by the ACHP (36 CFR Part 800) for compliance with Section 106 of the NHPA. Given the limited reasonable and foreseeable development, and the ability to re-design or modify projects to avoid significant impacts within the planning area, impacts under Alternative A would be considered negligible.

Alternative B – Close the Entire HGLA to Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Closed and Unavailable for Geothermal Exploration, Development and Leasing; Deny Authorization of All Pending Leases Within the HGLA

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications.

Alternative B would not result in any impacts to cultural resources because no geothermal development would occur within the HGLA. Alternative B would not change BLM's existing management goals under the CDCA plan for cultural resources within the planning area.

Alternative C – Open the HGLA to Geothermal Exploration, Development and Leasing; with No Surface Occupancy (NSO) Allowed in Sensitive Areas; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Leasing; Authorize All Pending Leases within the HGLA

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the HGLA under restrictions of the No Surface Occupancy (NSO) stipulations NSO-HGLA-1 and NSO-HGLA-2, as well as Controlled Surface Use stipulations CSU-HGLA-1 and CSU-HGLA-3. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to cultural resources under Alternative C are similar to those discussed under Alternative A. However, under Alternative C, the BLM can further eliminate impacts, if necessary, by protecting potentially sensitive or high value cultural resource areas because of the NSO and CSU requirements. Similar to Alternative A, before any specific leases for geothermal exploration or development can be granted by the BLM, treatment of cultural resources would follow the procedures established by the ACHP (36 CFR part 800) for compliance with Section 106 of the NHPA. Alternative C would not change BLM's existing management goals under the CDCA plan for cultural resources within the planning area. Given the limited reasonable and foreseeable development, and the ability to re-design or modify projects to avoid significant impacts within the planning area, impacts under Alternative C would be considered negligible.

Alternative D – Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have Designated Areas within the HGLA Open and Available for Geothermal Leasing; Amend the CDCA Plan to have Designated Areas within the HGLA Closed and Unavailable for Geothermal Leasing; Authorize All Pending Leases Within the HGLA

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, 13,773 acres would be closed and the remaining acres would be open in this alternative. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to cultural resources, under Alternative D, are similar to those discussed under Alternatives A and C. However, under Alternative D, impacts are reduced because potentially sensitive or high value cultural resource areas are closed to geothermal leasing and subject to the No Surface Occupancy (NSO) stipulations NSO-HGLA-1 and NSO-HGLA-2, as well as Controlled Surface Use stipulations CSU-HGLA-1 and CSU-HGLA-3. Similar to Alternatives A and C, before any specific leases for geothermal exploration or development can be granted by the BLM, treatment of cultural resources would follow the procedures established by the ACHP (36 CFR part 800) for compliance with Section 106 of the NHPA. Alternative D would not change BLM's existing management goals under the CDCA plan for cultural resources within the planning area.
Given the limited reasonable and foreseeable development, and the ability to re-design or modify projects to avoid significant impacts within the planning area, impacts under Alternative D would be considered negligible.

Alternative E – No Action

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA. The three pending lease applications would be denied.

Alternative E would not result in any impacts to the cultural resources of the HGLA because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines. Alternative E would not change BLM's existing management goals under the CDCA plan for cultural resources within the planning area.

4.9 PALEONTOLOGY

4.9.1 Methodology

4.9.1.1 *Management Goals*

The management goals of the CDCA Plan pertaining to paleontological resources include:

- Ensure that paleontological resources are given full consideration in land use planning and in 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.

BLM Instruction Memorandum (IM) No. 2008-2009, issued October 15, 2007, states that the Potential Fossil Yield Classification (PFYC) system will be used to classify paleontological resource potential on public lands in order to assess possible impacts and mitigation needs for federal actions involving surface disturbance, land tenure adjustments, and land-use planning. The PFYC classification system for paleontological resources is intended to provide a uniform tool to assess potential occurrences of paleontological resources and evaluate possible impacts. It uses geologic units as base data.

It is also the policy of the BLM (BLM IM 2009-011, October 1, 2008) that potential impacts from federal actions on public lands be identified and assessed, and proper mitigation actions be implemented when necessary to protect scientifically significant paleontological resources. This IM together with the PFYC system (IM 2008-009) provides guidance for the assessment of potential impacts to paleontological resources, field survey and monitoring procedures, and recommended mitigation measures that would better protect paleontological resources impacted by federal actions.

PRPA (Public Law 111-011 Subtitle D) gives land managing agencies the authority to specifically protect and manage paleontological resources on federal lands. PRPA was passed by Congress in 2009. The BLM is currently in the process of developing guidelines and procedures to manage paleontological resources on its lands using scientific principles and expertise.

Operators will determine whether paleontological resources exist in a project area on the basis of the sedimentary context of the area, a records search for past paleontological finds in the area, and/or, depending on the extent of existing information, a paleontological survey. If paleontological resources are present at the site, or if areas with a high potential to contain paleontological material have been identified, a paleontological resources management plan will be developed. This plan will include a mitigation plan for avoidance, removal of fossils, or monitoring. If an area exhibits a high potential but no fossils were observed during survey, monitoring by a qualified paleontologist may be required during excavation and earthmoving in the sensitive area. The operator will submit a report to the agency documenting these activities. The paleontological resources management plan also will (1) establish a monitoring program, (2) identify measures to prevent potential looting/vandalism or erosion impacts, and (3) address the education of workers and the public to make them aware of the consequences of unauthorized collection of fossils on public land.

4.9.1.2 Impact Criteria

A paleontological resource or site can be considered important when it meets any of the following criteria:

- It is the best example of its kind locally or regionally;
- Illustrates a geologic principle;
- Provides a critical piece of paleo-biological data;
- Encompasses any part of a "type locality" of a fossil or formation;
- Contains a unique or particularly unusual assemblage of fossils;
- Occupies a unique position stratigraphically; or

- Occupies a unique position, proximally, distally or laterally within a formation's extent or distribution

Activities that result in the disturbance or loss of fossils that meet these criteria or that result in the unauthorized collection of such fossils from BLM-managed land would be considered to have impacts on paleontological resources.

As mentioned in Section 3.4.1.3, the entire HGLA is considered to have low potential for containing paleontological resources (D. Storm 2009, personal communication), although Coso Formation deposits in the eastern part of the HGLA could contain fossils.
Therefore, the impact level for paleontological resources for the entire study area is classified as:

Low
A low impact to paleontological resources would result if the construction, operation, or maintenance of the proposed project would potentially cause ground disturbance or other adverse changes to lands that have been defined as having low sensitivity for paleontological resources.

No Identifiable Impact
No identifiable impact would be indicated where no measurable or suspected adverse impact would occur to any paleontological resources. These areas would include only those lands where geologic formations have been demonstrated to contain fossils.

4.9.2 Direct/Indirect Impacts

4.9.2.1 *General Impacts*

Geothermal exploration and drilling, the construction of geothermal plants and wells, and the construction of roads and transmission lines will have the potential to impact paleontological resources if they are present in the HGLA.

In general, for project areas that are underlain by paleontological sensitive geologic units, the greater the amount of ground disturbance, the higher the potential for impacts to paleontological resources. For project areas that are directly underlain by geologic units with no paleontological sensitivity, there is no potential for impacts on paleontological resources. However, as stated above, the entire HGLA is considered to have low potential for containing paleontological resources.

In some situations, the BLM may determine, based on local geological conditions, that proposed geothermal exploration or construction activities in a specific location warrants further analysis for paleontological resources or monitoring by a paleontologist.

4.9.2.2 *Impacts by Alternative*

<u>Alternative A</u> – **Open the Entire HGLA for Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Exploration, Development and Leasing; Authorize All Pending Leases Within the HGLA**

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Groundwater extraction for consumptive use during exploration, development, and production would be allowed, but controlled or restricted by stipulation. Limited groundwater use may be allowed under certain conditions specified in Chapter 2 and in SA-HGLA-10. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres.

No adverse impacts are expected under Alternative A based on the low probability of occurrence of paleontological resources in the HGLA. In the event that future site-specific permitting studies would identify sensitive resources that warrant protection or preservation, the BLM would stipulate appropriate, project-specific onsite mitigation measures. As a result, impacts under Alternative A, if any, are considered low.

<u>Alternative B</u> – **Close the Entire HGLA to Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Closed and Unavailable for Geothermal Exploration, Development and Leasing; Deny Authorization of All Pending Leases Within the HGLA**

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications.

Alternative B would not result in any impacts to paleontological resources because no geothermal development would occur within the HGLA.

Alternative C – Open the HGLA to Geothermal Exploration, Development and Leasing; with No Surface Occupancy (NSO) Allowed in Sensitive Areas; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Leasing; Authorize All Pending Leases within the HGLA

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the HGLA under restrictions of the No Surface Occupancy (NSO) stipulation NSO-1. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres.

No adverse impacts are expected under Alternative C based on the low probability of occurrence of paleontological resources in the HGLA. In the event that future site-specific permitting studies would identify sensitive resources that warrant protection or preservation in the NSO area, Alternative C would provide some additional protection compared to Alternative A.

Alternative D – Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have Designated Areas within the HGLA Open and Available for Geothermal Leasing; Amend the CDCA Plan to have Designated Areas within the HGLA Closed and Unavailable for Geothermal Leasing; Authorize All Pending Leases Within the HGLA

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, 13,773 acres would be closed and the remaining acres would be open in this alternative. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

No adverse impacts are expected under Alternative D based on the low probability of occurrence of paleontological resources in the HGLA, additional protection of paleontological resources that may occur in the closed areas would be provided in this Alternative as compared to Alternative A.

Alternative E – **No Action**

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA. The three pending lease applications would be denied.

Alternative E would not result in impacts to paleontological resources because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines.

4.10 VISUAL RESOURCES

4.10.1 *Methodology*

Visual resource impacts could result from implementation of specific elements of the Haiwee RFD scenario, including initial exploration of the HGLA and the subsequent construction, operation and maintenance of new wells, two 30 MW geothermal plants, access roads, and new transmission lines.

Visual resource impacts could be caused by these activities and new facilities being seen from sensitive viewpoints, and from their effects to the inherent aesthetic values of the landscape and scenic quality. Impacts to sensitive viewers and landscape scenic quality would typically be highest when influenced by the following changes to the landscape related to future development in the HGLA.

Short-term

- Fugitive dust from site preparation and ground clearing activities,
- High profile and/or large construction equipment such cranes, loaders, bulldozers, cement trucks, or
- Nighttime lighting required for construction and safety.

Long-term

- Geothermal plant facilities including cooling towers and well heads,
- Linear facilities including roads, transmission lines, and above-ground pipelines,
- Permanent ground disturbance and vegetation clearing,
- Water vapor emanating from the cooling tower, or
- Nighttime lighting required for operations, safety, and security.

4.10.1.1 *Management Goals*

In its Recreation Element the CDCA Plan, states for its Visual Resources Management Program:

- 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.

Visual Resource Inventory (VRI) Classes were established by the Visual Resource Management (VRM) Inventory that preceded this EIS (Michael Clayton 2009), as discussed in Chapter 3. The BLM may establish the VRI Classes as interim VRM Classes in this EIS. However, these VRI Classes have not been officially designated by the BLM.

The visual resource impact assessment complies with the CDCA Plan by assessing the potential impacts of the proposed activities and facilities, and evaluating compliance of the potential activities and facilities with the VRI Classes.

4.10.1.2 *Impact Criteria*

This visual resource impact assessment is based on the elements of the BLM Contrast Rating Process found in the BLM's 8400 Series Visual Resources Manual (BLM 1986a). Visual Contrast Rating defines the degree of physical alteration of the landscape setting, which could be perceived without regard to specific viewpoints or viewing conditions. How the visual changes are seen from sensitive viewpoints determines the viewer impacts.

Visual Contrast

Visual contrast is determined by assessing the deviation in form, line, color, texture, scale, and landscape position between elements of the proposed action and its existing landscape setting. The BLM contrast rating system assesses the change created by the landform/water, vegetative, and structural features associated with a given project action within the existing landscape setting. How the visual changes are seen from sensitive viewpoints determines potential viewer impacts. How the visual changes potentially alter the aesthetic appeal of the landscape determines the scenic quality impacts. Contrast levels are typically characterized as strong, moderate, or weak. Each of the contrast components are described below.

Landform Contrast

Landform contrast is created by alteration of landform patterns, exposure of soil, erosion scars, slumping, and other disturbances due to components of the RFD scenario that are uncharacteristic of the existing or natural landscape. Landform contrast is determined by the degree and duration of ground disturbance. Strong landform contrast levels typically occur in areas with high levels of ground disturbance in steep terrain, while weak landform contrast levels typically occur in areas with low levels of ground disturbance. Open pit mining within the HGLA could also influence landform contrast, resulting in weak contrast levels in specific locations where existing disturbance from mining activities occurs.

Vegetation Contrast

Vegetation contrast is the change in cover and patterns that could result from vegetation clearing required for construction and operation of a given project action. Vegetation contrast is determined by the diversity, complexity and density of vegetation types, and the required clearing and construction. Strong vegetation contrast levels occur in areas where extensive, highly visible clearing is required and vegetation is uniform, dense, slow to recover, or may not be allowed to regrow due to height restrictions and safety constraints. Weak vegetation contrast levels occur in areas where vegetation cover is either lacking or sparse, has a high level of recoverability, or is visually compatible with actions where little vegetation clearing is required.

As discussed in Chapter 3, there are 22 distinct cover classifications in the HGLA. Of these, the nine classifications with more than 20 acres in the HGLA are listed in Table 4.10-1.

Table 4.10-1 Cover Classification Matrix

Classification	Vegetation Description	Acreage in HGLA	Percentage of Action Area	Typical Contrast Level*

Classification	Vegetation Description	Acreage in HGLA	Percentage of Action Area	Typical Contrast Level*
Inter-Mountain Basins Big Sagebrush Shrubland	Shrubland occurring in basins.	549 acres	2%	Strong
Mojave Mid-Elevation Mixed Desert Scrub	Shrubland on rolling to steep terrain.	9,381 acres	38%	Moderate/Weak
North American Warm Desert Bedrock Cliff and Outcrop	Barren and sparsely vegetated steep cliff faces, narrow canyons, rock outcrops, and scree and talus slopes.	9,594 acres	39%	Weak
North American Warm Desert Pavement	Unvegetated and very sparsely vegetated lands with a pavement-like "desert varnish" on ground surfaces.	292 acres	1%	Weak
North American Warm Desert Riparian Woodland and Shrubland	Riparian corridors dominated by mixture of trees and shrubs.	86 acres	0.30%	Strong
North American Warm Desert Volcanic Rockland	Barren and sparsely vegetated volcanic rocklands.	779 acres	3.00%	Weak
North American Warm Desert Wash	Shrublands and grasslands occurring in linear strips along washes or arroyos.	303 acres	1%	Strong/Moderate
Sonora-Mojave Creosote bush-White Bursage Desert Scrub	Sparse to moderately vegetated shrubland.	3,337 acres	13%	Moderate/Weak**
Sonora-Mojave Mixed Salt Desert Scrub	Shrubland associated with playas and valley bottoms.	96 acres	0.40%	Moderate/Weak

*Contrast levels may vary based on the actual type and density of vegetation confirmed through field surveys and degree of ground disturbance and vegetation clearing requirements for a specific project.

**Strong contrast levels may occur if areas of very dense vegetation are encountered during field surveys for a specific project.

Structure Contrast

Structure contrast examines the compatibility of geothermal facilities with the existing landscape. Structure contrast would be greatest where there are no other existing man-made structures (e.g., buildings, power lines, etc.) visible in the landscape. Existing structures were identified to evaluate levels of contrast that could result from construction and operation of a geothermal plant. Existing structures that were identified within the HGLA include several high-voltage transmission lines, two LADWP aqueducts, as well as buildings in the communities of Coso Junction and Dunmovin. Additional structures related to mining activity could also be present within the HGLA and could influence contrast levels at specific locations.

Visual Contrast Levels
Three visual contrast levels (strong, moderate, and weak) are used to describe the potential visual contrast that could result from elements identified in the proposed RFD scenario. The following describes some of the conditions associated with each visual contrast level:

Strong Visual Contrast

Soil disturbance and construction of new facilities or access roads in steep terrain (steep terrain is generally considered to be 20 percent or greater slopes.),
Removal of dense overstory or shrub vegetation for new facilities such as geothermal plants, well heads, buildings, transmission lines and pipelines, or road ROWs, or
Construction of new facilities in a landscape with no existing man-made structures.

Moderate Visual Contrast

Soil disturbance and construction of new facilities or access roads in rolling terrain with occasional short, steep slopes, (rolling terrain is generally considered to include 10 to 20 percent slopes,
Removal of scattered overstory, shrub, scrub, riparian and wash vegetation for new facilities such as geothermal plants, well heads, buildings, transmission lines and pipelines, or road ROW, or
Construction of new facilities in a landscape with existing man-made structures of a dissimilar type or smaller scale.

Weak Visual Contrast

Soil disturbance and construction of short spur roads or crushed vegetation from overland access to new facility sites in flat terrain (flat terrain is generally considered to include 0 to 10 percent slopes),
Minimal removal of vegetation for new facilities such as geothermal plants, well heads, buildings, transmission lines and pipelines, or roads ROW, or
Construction of new facilities in a landscape with existing man-made structures of a similar type or larger scale.

The landform, vegetation, and structure contrast levels are combined to determine an overall visual contrast level, as illustrated in Table 4.10-2. The overall visual contrast levels identified in Table 4.10-2 are based on the general, existing conditions within the HGLA. As stated above, additional, site-specific visual impact assessments would be performed as part of any future permitting actions.

Table 4.10-2 Visual Contrast Levels Matrix

	VEGETATION CONTRAST								
	Strong			**Moderate**			**Weak**		
Landform Contrast									
Strong	S	S	M	S	M	M	S	M	W
Moderate	S	S	M	S	M	W	S	M	W
Weak	S	M	W	S	M	W	M	M	W
Structure Contrast	**S**	**M**	**W**	**S**	**M**	**W**	**S**	**M**	**W**

S = Strong Contrast; M = Moderate Contrast; W = Weak Contrast

Impact Levels

Potential impact levels were identified for the following visual resources:

- Communities
- Recreation and preservation areas (e.g., parks, designated wilderness areas, trails)
- Travel corridors (e.g., highways, roads)
- Cultural sites
- Scenic quality

To determine potential visual impacts, contrast levels for various elements of the Haiwee RFD scenario were compared with the visibility and distance zones from the sensitive viewpoints listed above, and with the existing scenic quality of the HGLA. Tables 4.10-3 and 4.10-4 document the conditions in which each potential impact level for scenic quality and sensitive viewers could occur. Scenic Quality classes A, B and C are defined in Chapter 3, Section 3.10 Visual Resources.

Table 4.10-3 Scenic Quality Impacts

	VISUAL CONTRAST		
SCENIC QUALITY CLASS	**Strong**	**Moderate**	**Weak**
A	H	H	M
B	H	M	L
C	M	L	L

H = High Impacts; M = Moderate Impacts; L = Low Impacts

Table 4.10-4 Sensitive Viewer Impacts

DISTANCE/VISIBILITY THRESHOLD*		VISUAL CONTRAST		
		Strong	Moderate	Weak
0 to 3-5 miles (FG/MG)	0 to 0.5 miles (FG)	H	M	L
	0.5 to 3-5 miles (MG)	H/M	M/L	L
Beyond 3-5 miles (BG)		M/L	L	L

H = High Impacts; M = Moderate Impacts; L = Low Impacts; FG/MG = Foreground/Middleground; BG = Background* Defining more specific or narrow ranging distance zones would allow for more discreet impact levels to be characterized.

Typically, strong visual contrast resulting under the RFD scenario, when viewed from high sensitivity viewpoints at close range and/or when located within Class A scenic quality landscapes, could result in the highest levels of potential impact. Visual impact levels become generally lower as visual contrast becomes weaker, as the distance from the viewpoint increases, or as the scenic quality of the landscape decreases as, for example, for viewers beyond three miles and/or within Class B or C scenic quality landscapes. Typical visual impact levels are defined as follows:

High Impacts

High visual impact levels for sensitive viewpoints could result from high levels of visual contrast associated with the presence of built elements of the RFD scenario, vegetation removal, and/or exposure of contrasting soil/rock color from ground disturbing activities that are visible within the foreground or middleground distance zones. High visual impact levels for scenic quality could result from strong visual contrast in areas of Class A or Class B scenic quality; although no Class A scenic quality was inventoried within the HGLA.

Moderate Impacts

Moderate visual impacts for sensitive viewpoints could result from moderate levels of visual contrast associated with the presence of built elements of the RFD scenario, vegetation removal, and/or exposure of contrasting soil/rock color from ground disturbing activities that are visible within the foreground or middleground distance zones. Moderate visual impact levels for scenic quality could result from moderate or weak visual contrast in areas of Class B scenic quality, and strong contrast is areas of Class C scenic quality.

Low Impacts

Low visual impacts for sensitive viewpoints could result from weak levels of visual contrast associated with the presence of built elements of the RFD scenario, vegetation removal, and exposure of contrasting soil/rock color from ground disturbing activities that are visible within the foreground or middleground distance zones and all levels of visual contrast in the background distance zone. Low visual impact levels for scenic quality could result from moderate or weak visual contrast in areas of Class C scenic quality.

Because perception of detail and dominance of the landscape generally decreases with increased distance from the viewer, sensitive viewer impacts may vary within a distance zone. Sensitive viewer impacts are likely to be higher within the 'foreground' portion and lower within the 'middleground' portion of the foreground or middleground distance zones. A distance of 0-0.5 mile is used to define the foreground and a distance of 0.5 to 3-5 miles is used to define the middleground. These distances may require revision for analysis of specific program components at specific locations within the HGLA.

Because this impact assessment is based on BLM's Haiwee RFD Scenario, the specific locations of facilities and ground disturbances are not known. As such, the program impacts have been discussed in a broad manner using a reasonable 'worst case scenario' that does not consider specific variables or mitigation measures that may reduce visual impacts. Design variables or mitigation measures to reduce or eliminate visual impacts were presented in Appendix A.

In addition to evaluating the potential visual impacts, the general compatibility of geothermal resource development with the VRI/VRM Classes identified within the HGLA was also characterized. Table 4.11-5 documents the conditions in which compatibility of each contrast level with each VRI/VRM Class could occur. VRI/VRM Classes are defined in Chapter 3 Section 3.11 Visual Resources.

Table 4.10-5 Compatibility of Contrast Levels with VRI/VRM Classes

VRI/VRM CLASS	VISUAL CONTRAST		
	Strong	Moderate	Weak
Class I*	N/A	N/A	N/A
Class II	No	No	Yes
Class III	Yes	Yes	Yes
Class IV*	N/A	N/A	N/A

*Indicates VRI/VRM Classes that are not present within the HGLA, and therefore not analyzed for visual contrast.

Scenic Quality Impacts

Generally, impacts to areas of Class C scenic quality in the HGLA could be low (refer to Chapter 3 scenic quality mapping of the HGLA). Potential impacts to Class C scenic quality could be low in areas with minimal slopes, vegetation types with moderate to weak contrast levels, and where existing transmission lines or aqueducts are present. Moderate impacts could potentially occur if construction or clearing occurs in areas where the combination of landform, vegetation and structure contrast levels would result in a strong overall contrast rating. This would most likely occur in areas where steep slopes occur, where vegetation types with strong or moderate contrast levels are present, and/or where no existing structures are present. However, moderate to low impacts could result from soil disturbance and vegetation clearing in areas where existing disturbance from mining activity occurs.

Impacts to areas of Class B scenic quality could generally be high to moderate if construction or clearing occurs in these areas due to the presence of steep slopes, the lack of existing structures, and the presence of pockets of vegetation types with strong potential contrast levels. Moderate to low impacts could result from disturbance and clearing in areas of flat to rolling terrain, where vegetation types result in moderate to weak contrast levels, and where existing structures occur. Moderate to low impacts could result from disturbance and clearing in areas where there is existing disturbance from mining activities

The non-competitive lease application areas are comprised solely of Class C scenic quality. Generally, in areas with minimal slopes, vegetation types with moderate to weak contrast levels, and where existing transmission lines or aqueducts are present, potential impacts to Class C scenic quality could be low. Moderate impacts could potentially occur if construction or clearing occurs in areas where the combination of landform, vegetation and structure contrast levels would result in a strong overall contrast rating. This would most likely occur in areas where steep slopes occur, where vegetation types with strong or moderate contrast levels are present, and where no existing structures are present. Potential strong or moderate contrast levels and potential high or moderate impacts to scenic quality are most likely to occur if construction or clearing occurs in the northeast portion of the area due to steep slopes, the lack of existing structures, and the presence of pockets of vegetation types with strong potential contrast levels.

Sensitive Viewer Impacts

Communities

Low impacts could occur for communities in the background distance zone including Olancha, Haiwee and Little Lake. Olancha is located over 10 miles north of the HGLA. Haiwee is located over five miles north of the HGLA. Little Lake is located over six miles to the south. These communities could have potential distant views of some elements of the RFD scenario, particularly the cooling tower plume, depending on their siting. This could result in low impacts.

The communities of Dunmovin and Coso Junction are located adjacent to and within the HGLA, respectively. Potential impacts for these communities could range from low to high, depending on the location of specific elements of the RFD Scenario. If geothermal facilities are located close to the communities where they could be a dominant component of the landscape, potential impacts could be high. If facilities and disturbance are located further away, or are screened fully or partially by topography, potential impacts could likely be low to moderate. Geothermal development could potentially be visually dominant when viewed from the communities. Visual dominance of geothermal development could be greatest if they are located very close to the communities, within the foreground distance zone (0-0.5 mile) or in a superior, or higher, position on steep slopes where visibility of the disturbance would be greatest. Generally, high to moderate impacts could occur if geothermal development occurs within the foreground distance zone (0-0.5 mile), while moderate to low impacts could occur if geothermal development occurs within the middleground distance zone (0.5 to 3-5 miles), depending on contrast levels at locations where construction or clearing might occur.

Transportation Corridors

Given the siting of various elements of the Haiwee RFD scenario, potential high visual impacts viewed from U.S. Highway 395 (US 395) could occur. The highway crosses through the southwestern portion of the HGLA and could have foreground or middleground views. Potential visual impacts to US 395 could range from high to low, depending on the location of construction or clearing. Various portions of the highway would have views at various distances of the HGLA.

Generally, minimal slopes and vegetation types with moderate to weak contrast levels occur within the foreground distance zone of US 395. These conditions, combined with the presence of existing transmission lines or aqueducts, could generally result in moderate to low potential visual impacts for the portions of US 395 that could have foreground views of geothermal development activities. Vegetation types with strong contrast levels, and/or a lack of existing structures in the foreground distance zone of US 395, could generally result in high to moderate potential visual impacts for the portions of the highway that could have foreground views of geothermal development activities.

Geothermal development activities, if visible from US 395 would constitute visual intrusions in the "scenic corridor" of the highway and could adversely affect the potential of the corridor to be designated as a California Scenic Highway, based on the program evaluation criteria. Refer to Section 3.13.2 Regulatory Framework for a summary of the evaluation criteria and process. Siting geothermal facilities to minimize visibility from the highway, maximizing the distance of development activities from the highway, and minimizing grading could minimize the level of visual intrusion.

Due to the highway's location on the floor of the Rose Valley, with mountain views to the east and west, the distant views of mountains could be affected by geothermal development activities located anywhere within the non-competitive leasing area, with the exception of some areas in the northeast portion where activities would likely be screened by topography. Maximizing the distance of any development from US 395, and avoidance of locating geothermal activities at higher elevations where they would be viewed from a lower location, could minimize visual impacts to sensitive viewers along US 395.

Recreation and Preservation Viewpoints

Background views and low impacts would potentially occur to Little Lake Overlook, located over six miles to the south of the HGLA, and to Fossil Falls, located four miles to the south. Impacts to these recreation areas would be greatest if disturbance and facilities are located on south facing slopes or ridges, where they would be highly visible due to their higher elevation and the high level of potential landscape contrast. However, visual impacts would not occur to these recreation sites if facilities and disturbance are located on or below north facing slopes where they would be screened by topography.

Foreground/middleground views and moderate impacts would potentially occur to the Haiwee trailhead, located almost three miles from the HGLA. Impacts would be greatest if disturbance and facilities are located on west facing slopes or ridges, where they would be highly visible due to their higher elevation and the high level of potential landscape contrast. Visual impacts would not occur if facilities and disturbance are located on or below east facing slopes where they would be screened by topography. Low to moderate impacts would occur if facilities and disturbance are located in the flat to rolling southwest portion of the HGLA at low elevations, with mountain ranges in the background so new facilities would not be "skylined".

Any impacts to Coso Hot Springs, located over 4.5 miles east of the HGLA, due to potential middleground or background views would be low. The majority of the HGLA would be screened from Coso Hot Springs by topography. Impacts may occur if facilities and disturbance are located on east facing slopes where they would potentially be visible from the springs.

Foreground/middleground views from the Sacatar Trail Wilderness, located 0.5 mile west of the HGLA, and the Coso Range Wilderness, located 0.7 mile northeast of the latter, could potentially occur for dispersed recreation viewers. Since no defined viewpoints (e.g. trails, campgrounds, vista locations) with views of the HGLA have been identified, potential impacts for the wilderness areas are considered to be low.

Additional potentially low impacts could occur to the South Sierra Wilderness for which no defined viewpoints have been identified. The South Sierra Wilderness is located almost six miles to the west of the HGLA. This wilderness area could, however, potentially have background views for dispersed recreation viewers.

In general, program development in the flat or rolling southwest portion of the HGLA would have the least visual impact to the wilderness areas, while locations on slopes and ridges would be more visible and increase potential visual impacts to these areas.

Night Lighting

Depending on the location of the geothermal facilities, on the type of lighting used, and on implementation of appropriate mitigation measures to minimize night-time visibility from sensitive viewpoints and light pollution; night lighting could contribute to potential night-time visual impacts for nearby communities, sensitive viewers along the US 395 corridor, and recreation and preservation viewers.

Cooling Tower Plumes

Viewers in nearby communities, along US 395, and recreation and preservation areas could have views of cooling tower vapor plumes that could result in impacts ranging from low to high, depending on the location of the facility and atmospheric conditions. Typically, the closer facilities are located to sensitive viewpoints, the greater the dominance of the vapor plume in the visual setting, and the greater potential impacts could be.

Compatibility with VRI Classes

The Visual Resource Management Inventory report identified scenic quality rating units, sensitive viewpoints, and VRI classes for the HGLA, which the BLM may establish as interim VRM classes in this EIS (for Class descriptions, refer to Chapter 3).

Geothermal leasing would generally be compatible with VRI/VRM Class III areas. The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape is expected to 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.

To meet the VRI/VRM Class III objective, facilities and disturbance should be located where they will not be a dominant element in the landscape for sensitive viewpoints. Locations in the flat to rolling areas of the HGLA that are not immediately adjacent to sensitive viewpoints would generally meet this objective. Locations immediately adjacent to sensitive viewpoints, or on steep slopes and ridges where geothermal activities would be an obvious and potentially dominant element of the landscape, would generally not meet this objective.

The objective of VRM/VRI Class II is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape. Due to the rugged nature of the Class II areas, cut and fill for wells, geothermal plants, and access for these areas would likely be substantial. Geothermal development activities would not likely meet this objective.

4.10.2 Direct/Indirect Impacts

4.10.2.1 Impacts by Alternative

The visual resource impact assessment is largely based on an evaluation of long-term impacts. Although short term impacts are expected to occur during construction as well, they are anticipated to be greatly reduced by implementation of the applicable mitigation measures listed in Appendix A.

Alternative A – **Open the Entire HGLA for Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Exploration, Development and Leasing; Authorize All Pending Leases Within the HGLA**

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Groundwater extraction for consumptive use during exploration, development, and production would be allowed, but controlled or restricted by stipulation. Limited groundwater use may be allowed under certain conditions specified in Chapter 2 and in SA-HGLA-10. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential visual impacts associated with Alternative A are discussed above, would vary with the specific location of future RFD facilities relative to sensitive receptors, and would be somewhat subjective. Landform contrast levels could generally be strong to moderate due to steep topography in the northeast portion of the HGLA, and generally weak in the remainder of the HGLA due to relatively flat to rolling terrain. Open pit mining sites could also influence landform contrast, resulting in weak landform contrast levels in specific locations where existing disturbance from mining activities occurs.

Vegetation contrast would vary depending on the type and density of the vegetation. The majority of the HGLA consists of Mojave Mid-Elevation Mixed Desert Scrub vegetation, where moderate to weak vegetation contrast levels could occur, and North American Warm Desert Bedrock Cliff and Outcrop vegetation, where weak vegetation contrast levels could occur. Strong vegetation contrast levels could occur in pockets of North American Warm Desert Wash, Inter-Mountain Basins Big Sagebrush Shrubland, and North American Warm Desert Riparian Woodland and Shrubland vegetation types.

Structure contrast could generally be weak in the vicinity of the existing high voltage transmission lines and aqueducts, moderate in the vicinity of the existing buildings in Coso Junction and Dunmovin, and strong in the remainder of the HGLA where no existing structures are located. Structure contrast levels could vary in areas of mining activity, dependent on the mining equipment or structures that may be present.

Overall, contrast levels under Alternative A could generally be moderate to high in the eastern and northern portions of the HGLA where steep slopes occur. Landform contrast could be moderate to high due to moderate to high levels of ground disturbance and steep terrain. Vegetation contrast could generally be low to moderate in barren or sparsely vegetated areas and moderate to high in areas of scrub, shrubland or woodland where more uniform and dense vegetation occurs. Structure contrast could generally be high in these areas due to the lack of manmade structures.

<u>Alternative B</u> – **Close the Entire HGLA to Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Closed and**

Unavailable for Geothermal Exploration, Development and Leasing; Deny Authorization of All Pending Leases Within the HGLA

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications.

Alternative B would not result in any visual impacts because no geothermal development would occur within the HGLA.

Alternative C – Open the HGLA to Geothermal Exploration, Development and Leasing; with No Surface Occupancy (NSO) Allowed in Sensitive Areas; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Leasing; Authorize All Pending Leases within the HGLA

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the HGLA under restrictions of the No Surface Occupancy (NSO) stipulation NSO-HGLA-1. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential visual impact projections for Alternative C would be generally similar as those discussed for Alternative A. However, Alternative C NSO restrictions could increase the distance between RFD facilities and potentially sensitive visual receptors, thus mitigating potentially adverse impacts. Potentially sensitive visual receptors would be identified as part of any future permitting actions to assess the degree of impact.

Alternative D – Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have Designated Areas within the HGLA Open and Available for Geothermal Leasing; Amend the CDCA Plan to have Designated Areas within the HGLA Closed and Unavailable for Geothermal Leasing; Authorize All Pending Leases Within the HGLA

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, 13,773 acres would be closed and the remaining acres would be open in this alternative. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential visual impacts associated with Alternative D would be generally similar as those for Alternatives A and C. However, Alternative D would close specific areas of the HGLA to geothermal leasing which could reduce visual impacts to some areas.

Alternative E – No Action

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA. The three pending lease applications would be denied.

Alternative E would not result in any visual impacts because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines.

4.11 LANDS AND REALTY

4.11.1 Methodology

4.11.1.1 *Management Goals*

The CDCA Plan sets 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

geothermal plants.

According to the CDCA Plan new gas, electric, and water transmission facilities as well as cables for interstate communication may be allowed only within appropriately designated corridors. Designated corridors within the HGLA include BLM Designated Utility Corridor A, a two mile wide corridor, and Section 368 Designated Energy Corridor 18-23, an approximately 1,050 foot wide corridor. Both corridors run north-south across the western portion of the HGLA. A one mile wide, five mile long corridor connecting the Coso Known Geothermal Resource Area (KGRA) with Utility Corridor A is also located on the southern portion of the HGLA.

4.11.1.2 *Impact Criteria*

The potential impacts of future geothermal development to land use resources are assessed with respect to two CDCA Plan management criteria:

- Do RFD actions conflict with multiple-use management of lands administered by the BLM? or
- Will RFD actions result in proposed uses that are incompatible with existing or adjacent land uses?

The potential impacts to land use resources from geothermal exploration, development, production, or closeout are ranked on a high-to-low risk scale as follows:

High
RFD actions have significant impacts on the above criteria;

Medium
RFD actions have moderate impacts on the above criteria; and

Low
RFD actions have minor or no impacts on the above criteria.

4.11.2 Direct/Indirect Impacts

4.11.2.1 General Impacts

Leasing creates a right, which could conflict with other existing or future land use authorizations. The FLPMA requires that prior existing rights must be recognized, so geothermal development would be designed to avoid or minimize impacts to existing authorized land uses or facilities. Through appropriate coordination with authorized land use holders, physical disturbances or temporary disruptions in use may be acceptable.

Areas of geothermal development and infrastructure such as at the Coso geothermal fields or Hay Ranch Water Extraction and Delivery Project create prior existing rights for the lessees, and could affect the direction or placement of future non geothermal related ROWs. Along the same lines, mission operations at the U.S. Department of Defense's China Lake Naval Air Weapons Station (NAWS) will be taken into consideration. Based on their locations, overhead high voltage transmission lines could potentially have impacts on flight lines and training operations at the China Lake NAWS. As such, coordination between the BLM and Department of Defense would be conducted prior to the approval of any future geothermal energy development to determine project compatibility with current and future military missions, and consistency with the Joint Service Restricted R-2508 Complex.
The potential impacts from management of lands and realty actions are assumed to be low since standard lease stipulations specify that all leasing activities are subject to these existing rights.

4.11.2.2 Impacts by Alternative

<u>Alternative A</u> – **Open the Entire HGLA for Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Exploration, Development and Leasing; Authorize All Pending Leases Within the HGLA**

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Groundwater extraction for consumptive use during exploration, development, and production would be allowed, but controlled or restricted by stipulation. Limited groundwater use may be allowed under certain conditions specified in Chapter 2 and in SA-HGLA-10. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to existing rights under Alternative A would be expected to be low based on recognition of existing use classification and prior existing rights. As discussed in Section 3.14.1, BLM lands within the CDCA have been assigned into five multiple use classes (MUC): Lands within the HGLA are designated MUC L which is designed to protect sensitive, natural, scenic, ecological, and cultural resource values. Class L lands within the West Mojave (WEMO) area are "managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished." However, geothermal electrical generation facilities may be allowed pursuant to licenses issued under 43 CFR Section 3250, et seq. if all applicable NEPA requirements are met. As a result, this alternative 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 of the subsurface geothermal resources would not affect existing realty agreements. However, development of new facilities, including ROWs, would require new grants.

According to the Land Use Element of the Inyo County General Plan, the HGLA and surrounding region falls within the State and Federal Lands Designation. This designation is characterized by absence of privately owned lands, and applied to those state- and federally-owned parks, forests, recreation, and/or management areas that have adopted management plans (Inyo County 2001). BLM's Alternative A would be consistent with the Inyo County General Plan, and with the Inyo County Zoning Ordinance. The impacts from implementing the Haiwee RFD on the existing land uses of the HGLA would be low.

Alternative B – Close the Entire HGLA to Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Closed and Unavailable for Geothermal Exploration, Development and Leasing; Deny Authorization of All Pending Leases Within the HGLA

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications.

Alternative B would not result in any impacts to lands and realty issues because no geothermal development would occur within the HGLA, and no new surface ROW grants would be required.

Alternative C – Open the HGLA to Geothermal Exploration, Development and Leasing; with No Surface Occupancy (NSO) Allowed in Sensitive Areas; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Leasing; Authorize All Pending Leases within the HGLA

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the

HGLA under restrictions of the No Surface Occupancy (NSO) stipulation NSO-1. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres.

The projected impacts under Alternative C would be similar to those discussed under Alternative A. In addition, Alternative C would also contain a NSO requirement which could result in less overlapping resource use in certain areas of this MUC L land.

Alternative D – Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have Designated Areas within the HGLA Open and Available for Geothermal Leasing; Amend the CDCA Plan to have Designated Areas within the HGLA Closed and Unavailable for Geothermal Leasing; Authorize All Pending Leases Within the HGLA

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, 13,773 acres would be closed and the remaining acres would be open in this alternative. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

The projected impacts of Alternative D would be similar to those discussed under Alternatives A and C. In addition to recognizing existing authorized land uses, Alternative D would also close specific areas of the HGLA to geothermal leasing to further reduce overlapping resource demands.

Alternative E – No Action

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA. The three pending lease applications would be denied.

Alternative E would not result in any impacts to lands and realty issues because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines.

4.12 PUBLIC HEALTH AND SAFETY

4.12.1 Methodology

4.12.1.1 *Management Goals*

The CDCA Plan does not establish specific management goals for public health and safety, or for the management of hazardous materials or wastes. However, the BLM's stated policy is to reduce threats to public health, safety, and property. In addition, in accordance with the FLPMA, the BLM is required to comply with applicable state standards for public health and safety. Moreover, the CDCA multiple-use classifications do not allow hazardous or non-hazardous waste disposal sites on public lands, except where authorized and landfills are suitable. Such public lands may be transferred to the appropriate owner/operator. The specific Multiple-Use Class L guidelines addressing waste disposal include:

- Hazardous waste disposal sites will not be allowed.
- New non-hazardous waste disposal sites will not be allowed

4.12.1.2 *Impact Criteria*

The potential impacts of geothermal exploration and development to public health and safety, and with regard to hazardous materials and waste, are assessed with respect to four criteria:

- Whether RFD actions create a hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials or wastes;
- Whether RFD 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;
- Whether RFD 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
- Whether RFD 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.

- Whether RFD actions, such as soil disturbance and geothermal emissions, add significant amounts of dust and chemical species (mercury, arsenic, antimony, alkalis for example) to the air that pose a threat to workers on-site and potentially result in increased deposition of these chemical species on the environment in population centers downwind of the project area.

The potential risks are ranked on a high-to-low risk scale as follows:

High
Potential impacts are ranked as high if significant impacts to the above criteria occurred;

Medium
Potential impacts are ranked as medium if moderate impacts to the above criteria occurred; and

Low
Potential impacts are ranked as low if minor or no impacts to the above criteria occurred.

4.12.2 Direct/Indirect Impacts

4.12.2.1 General Impacts

The potential hazardous and solid waste issues typically associated with geothermal exploration and development includes:

Exploration

Geothermal exploration activities have the potential for accidental drilling fluid or hydrocarbon spills, leakage from improperly constructed sump ponds or wastewater collection systems, improperly handled briny water from drilling, and accumulations of solid waste which could impact water quality or contaminate soils. Hydrocarbon spills could include hydraulic fluid, gasoline, oil, or grease from vehicles, generators, and exploratory drill rigs. Briny water from exploratory drilling, if improperly disposed, could raise the pH of discharges to hazardous levels. Accumulations of nonhazardous waste solids and liquids could include trash, drill cuttings, wastewater, bentonite, and cement generated during drilling operations.

Development

The public health and safety issues associated with the development phase of geothermal facilities are largely the same as described for the exploration phase, but the quantities are typically greater. In addition, stormwater runoff from well pads and plant facilities can contain elevated quantities of heavy metals and volatile organic compounds. Substantial quantities of non-hazardous solid waste and liquids could also be generated, further increasing the potential for contamination of water, soil, and possible proving toxic to the biota. Health concerns from local air quality issues may stem from increased dust emissions or the introduction of hazardous materials to the environment. While the potential for exposure to on-site workers exists at geothermal facilities, that potential is expected to be minor if all appropriate stipulations and BMPs are applied.

Operation

Operation of geothermal generating facilities and wells present a long-term potential source for spills and leaks. Spilled or leaked materials could include hydraulic fluid, gasoline, oil, paint, antifreeze, cleaning solvents, transformer insulating fluid, binary fluids, and grease. Potential discharges could result in adverse impacts to water, soil, air, and the biota. Accidental releases from sumps or wastewater collection systems could include hazardous water-treatment chemicals such as chlorine. Stormwater runoff could contain elevated levels of heavy metals and volatile organic compounds. In addition, operation of these the two RFD facilities would likely generate substantial quantities of non-hazardous solid wastes.

Proper management of these substances consistent with federal and state solid and hazardous waste regulations would reduce or eliminate the potential for soil or water contamination, thus minimizing or avoiding adverse effects to worker health and safety, to the surrounding communities, or to the environmental resources of the HGLA. Potential impacts from the storage and handling of solid and hazardous wastes would be further minimized through adherence to lease stipulations and implementation of appropriate BMPs (see Appendix A). As such, the risk for potentially significant impacts involving hazardous materials would be ranked low.

4.12.2.2 *Impacts by Alternative*

Alternative A – Open the Entire HGLA for Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Exploration, Development and Leasing; Authorize All Pending Leases Within the HGLA

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Groundwater extraction for consumptive use during exploration, development, and production would be allowed, but controlled or restricted by stipulation. Limited groundwater use may be allowed under certain conditions

specified in Chapter 2 and in SA-HGLA-10. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts associated with Alternative A are discussed above. The impacts to public health and safety are expected to be low based on the terms and conditions of BLM's lease, and adherence to applicable construction stormwater pollution prevention and subsequent NPDES permit requirements. All hazardous materials as well as hazardous and solid wastes will be handled, stored, and disposed of consistent with applicable safety guidelines and regulatory requirements, and in compliance with the Multiple-Use Class L guidelines. In the event that future site-specific permitting studies would identify sensitive resources that warrant additional protection, the BLM would stipulate appropriate, project-specific mitigation measures.

Alternative B – **Close the Entire HGLA to Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Closed and Unavailable for Geothermal Exploration, Development and Leasing; Deny Authorization of All Pending Leases Within the HGLA**

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications.

Alternative B would not result in impacts to public health and safety because no geothermal development would occur within the HGLA.

Alternative C – **Open the HGLA to Geothermal Exploration, Development and Leasing; with No Surface Occupancy (NSO) Allowed in Sensitive Areas; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Leasing; Authorize All Pending Leases within the HGLA**

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the HGLA under restrictions of the No Surface Occupancy (NSO) stipulation NSO-HGLA-1. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts associated with Alternative C are similar to those discussed for Alternative A. In addition to complying with existing laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form Alternative C contains NSO requirements that may protect potentially sensitive resources or receptors. As such, the impacts to public health and safety under Alternative C are expected to be low.

<u>Alternative D</u> – **Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have Designated Areas within the HGLA Open and Available for Geothermal Leasing; Amend the CDCA Plan to have Designated Areas within the HGLA Closed and Unavailable for Geothermal Leasing; Authorize All Pending Leases Within the HGLA**

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, 13,773 acres would be closed and the remaining acres would be open in this alternative. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to public health and safety under Alternative D would be generally similar as those for Alternatives A and C. In addition to complying with existing laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form, Alternative C closes specific areas of the HGLA which could provide additional protection of potentially sensitive resources or receptors. As such, the impacts to public health and safety under Alternative C are expected to be low.

<u>Alternative E</u> – **No Action**

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA. The three pending lease applications would be denied.

Alternative E would not result in any public health and safety impacts because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines.

4.13 MINERAL RESOURCES

4.13.1 Methodology

4.13.1.1 *Management Goals*

The most applicable management goal of the CDCA Plan is the identification of potential sites for development of geothermal, wind, and solar generating facilities. The Plan's general goals for Geology-Energy-Minerals (G-E-M) resources are to:

- 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, G-E-M database, and professional, technical, and managerial staff knowledgeable in mineral exploration and development.

The Multiple-Use Class L management guidelines pertaining to leasable minerals state:

> "Except as provided in Appendix 5.4, 516, DM 6, NEPA procedures titled "Categorical Exclusions", prior to any lease, notice, or application that was filed pursuant to 43 CFR 3045, 3100, 3200, 3500, and S.O. 3087, as amended, an EA will be prepared on the proposed action. Mitigation and reclamation measures will be required to protect and rehabilitate sensitive scenic, ecological, wildlife, vegetative, and cultural values."

4.13.1.2 *Impact Criteria*

The potential risk of geothermal development impacts on G-E-M resources is assessed with respect to one criterion. Potential adverse impacts could occur if RFD actions were to:

- Reduce or prevent exploration or recovery of important economic mineral resources.

The potential risk of future impacts from geothermal exploration, development, production, or closeout is ranked on the following scale:

High
If there are significant impacts on the above criteria;

Medium
If there are moderate impacts on the above criteria; and

Low
If there are minor or no impacts on the above criteria.

4.13.2 Direct/Indirect Impacts

4.13.2.1 *General Impacts*

Mining, mineral material sites, unpatented mining claims, and abandoned mines exist in portions of some of the lease areas, and geothermal leases would be subject to valid existing rights. Both geothermal development and mining could be conducted in the same general area. The extent of their compatibility would depend on the nature of the mining operation and of the geothermal development. For example, pit mining or quarrying operations could interfere with siting of more permanent geothermal facilities (wells, pipelines, geothermal plants). Thus, geothermal development of an area could potentially restrict the ability to extract minerals.

Although the HGLA contains mineral resources, construction and operation of geothermal production plants is not expected to significantly affect access to or future development of these minerals or mineral production. In fact, geothermal exploration, including drilling deep wells, may have the beneficial impact of identifying additional, previously unrecognized, mineral deposits. There is a low potential risk for impacts on mineral resources.

4.13.2.2 *Impacts by Alternative*

<u>Alternative A</u> – **Open the Entire HGLA for Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Exploration, Development and Leasing; Authorize All Pending Leases Within the HGLA**

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Groundwater extraction for consumptive use during exploration, development, and production would be allowed, but controlled or restricted by stipulation. Limited groundwater use may be allowed under certain conditions specified in Chapter 2 and in SA-HGLA-10. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to mining operations in the HGLA under Alternative A are discussed above, and considered low. Future geothermal leases would be subject to existing rights, are not necessarily incompatible with mining, and would be subject to all applicable laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form.

Alternative B – Close the Entire HGLA to Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Closed and Unavailable for Geothermal Exploration, Development and Leasing; Deny Authorization of All Pending Leases Within the HGLA

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications.

Alternative B would not result in any impacts to mining because no geothermal development would occur within the HGLA.

Alternative C – Open the HGLA to Geothermal Exploration, Development and Leasing; with No Surface Occupancy (NSO) Allowed in Sensitive Areas; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Leasing; Authorize All Pending Leases within the HGLA

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the HGLA under restrictions of the No Surface Occupancy (NSO) stipulation NSO-HGLA-1. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to mining operations in the HGLA under Alternative C are similar to those discussed under Alternative A, and considered low. Under Alternative C NSO requirements for part of the HGLA could further eliminate potential conflicts between mining operations and geothermal leasing.

<u>Alternative D</u> – Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have Designated Areas within the HGLA Open and Available for Geothermal Leasing; Amend the CDCA Plan to have Designated Areas within the HGLA Closed and Unavailable for Geothermal Leasing; Authorize All Pending Leases Within the HGLA

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, 13,773 acres would be closed and the remaining acres would be open in this alternative. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to mining operations in the HGLA under Alternative D are similar to those discussed for Alternative A. Under Alternative D portions of the HGLA would be closed which could further eliminate potential conflicts between mining operations and geothermal leasing.

<u>Alternative E</u> – No Action

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA. The three pending lease applications would be denied.

Alternative E would not result in any impacts to mining because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines.

4.14 WILD HORSES AND BURROS

4.14.1 Methodology

4.14.1.1 *Management Goals*

The CDCA Plan provides overall management direction for all public lands in the CDCA. The CDCA Plan's Wild Horse and Burro Element lists the following goals:

- Provide for the year-long food requirements of wild horses and burros by reserving sufficient forage to meet the biological requirements of a specified number of animals.

- Provide adequate cover for wild horses and burros by maintaining free access to existing cover for these animals. Attainment of this objective would be consistent with the need to restrict wild horse and burro use from selected riparian areas, when required to protect other resource values.

- Provide adequate water to meet the year-long requirements of wild horses and burros by improving existing waters, developing new waters, and developing alternative waters when wild horses and burros must be excluded from existing water.

- Provide adequate living space for wild horses and burros by designing new structures or modifying existing structures in such a manner as to allow for the normal distribution and movement patterns of these animals. The key to attainment of this objective is preservation of the home ranges established by a majority of wild horses and burros by use of individual Herd Management Areas (HMAs). Attainment of this objective would be consistent with the need to restrict wild horse and burro access in selected areas in order to protect other resource values, and specifically to manage burros so that they do not jeopardize the continued existence and welfare of bighorn sheep.

- Protect wild horses and burros on public lands by conducting surveillance to prevent unauthorized removal or undue harassment of the animals.

The corresponding Multiple-Use Class L guidelines addressing wild horses and burros state:

- Populations of wild and free-roaming horses and burros will be maintained in healthy, stable herds, in accordance with the Wild and Free-Roaming Horse and Burro's Act of 1971, but will be subject to controls to protect sensitive resources.

The CDCA Plan established 17 Herd Management Areas (HMAs) within the CDCA where populations of wild horses and burros are managed and protected. Moreover, the Wild Free-Roaming Horses and Burros Act of 1971 dictates that the BLM has the responsibility to protect, manage, and control wild horses and burros. As such, appropriate stipulations and mitigation measures may be applied on a case-by-case basis to leases where direct and indirect geothermal resource development may impact these species.

4.14.1.2 Impact Criteria

Potential impacts to wild horses and burros from exploration and geothermal development in the HGLA are assessed with respect to two criteria:

- Do the RFD actions have an adverse effect on the habitat of wild horses and burros? and
- Do the RFD actions interfere with the movement of wild horses and burros?

The potential risks to wild horses and burros from geothermal exploration, development, production, or closeout are ranked from high-to-low as follows:

High
If there are significant impacts to the above criteria;

Medium
If there are moderate impacts to the above criteria; and

Low
If there are minor or no impacts to the above criteria.

4.14.2 Direct/Indirect Impacts

4.14.2.1 General Impacts

The noise and human presence connected with geothermal exploration, development, and utilization can influence herd distribution and movements within the Centennial HMA. In response, wild horses and burros would likely shift their movements to avoid disturbances. However, it should be noted that there are no natural perennial waters in the HGLA that the animals are dependent upon, and their occurrence has been reported primarily from portions of the China Lake NAWS. As such, wild horses and burros may utilize the southeastern portion of the HGLA during portions of winter and spring when ephemeral water is available and ephemeral plants provide forage. Based on their general absence or, at best, seasonal use of a portion of the HGLA, the impacts from the Haiwee RFD scenario on the movement of wild horses and burros is expected to be low.

The potential for indirect impacts to the wild horse and burro population would be minimized through compliance with State and federal regulations, adherence to lease stipulations, and implementation of appropriate BMPs (Appendix A). Recommended BMPs for this resource include:

- The operator will ensure employees, contractors, and site visitors avoid harassment and disturbance of wild horses and burros, especially during reproductive (e.g., breeding and birthing) seasons. If wild horses or burros are encountered throughout the operation during transport of materials, the driver will reduce speed or stop as necessary to avoid frightening the animals. Harassment of wild horses and burros is a criminal offense and punishable under 43 CFR 4770.5. In addition, any pets will be controlled to avoid harassment and disturbance of wild horses and burros.

- Ponds, tanks and impoundments containing harmful liquids will be excluded from wildlife access by fencing, netting or covering at all times when not in active use. Water ponds or other means of water that normally would not be there in a natural setting shall be fenced off to preclude wild horses and burros access.

Observations of potential problems regarding wild horses or burros, including animal mortality, will be immediately reported to the appropriate agencies.

4.14.2.2 *Impacts by Alternative*

Alternative A – Open the Entire HGLA for Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Exploration, Development and Leasing; Authorize All Pending Leases Within the HGLA

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Groundwater extraction for consumptive use during exploration, development, and production would be allowed, but controlled or restricted by stipulation. Limited groundwater use may be allowed under certain conditions specified in Chapter 2 and in SA-HGLA-10. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to wild horses and burros under Alternative A are discussed above. The anticipated impacts under Alternative A are expected to be low due to their status of occurrence on the HGLA, and adherence of all geothermal exploration, development, and operation activities to applicable laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form. In the event that future site-specific permitting studies would identify the presence of these animals, or of sensitive resources like water sources, the BLM would stipulate appropriate, project-specific mitigation measures to protect these species.

Alternative B – Close the Entire HGLA to Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Closed and Unavailable for Geothermal Exploration, Development and Leasing; Deny Authorization of All Pending Leases Within the HGLA

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications.

Alternative B would not result in any impacts to wild horses and burros because no geothermal development would occur within the HGLA.

Alternative C – Open the HGLA to Geothermal Exploration, Development and Leasing; with No Surface Occupancy (NSO) Allowed in Sensitive Areas; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Leasing; Authorize All Pending Leases within the HGLA

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the HGLA under restrictions of the No Surface Occupancy (NSO) stipulation NSO-HGLA-1. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to wild horses and burros under Alternative C are similar to those discussed under Alternative A, above. Under Alternative C wild horses and burros, or their watering areas and other key habitat features, would be further protected in the areas of NSO. Impacts under Alternative C are expected to be low based on these options, on the status of wild horses and burros on the HGLA, and adherence of geothermal exploration, development, and operation activities to applicable laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form.

Alternative D – **Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have Designated Areas within the HGLA Open and Available for Geothermal Leasing; Amend the CDCA Plan to have Designated Areas within the HGLA Closed and Unavailable for Geothermal Leasing; Authorize All Pending Leases Within the HGLA**

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, 13,773 acres would be closed and the remaining acres would be open in this alternative. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to wild horses and burros under Alternative D are similar to those discussed under Alternatives A and C, above. Impacts under Alternative D are expected to be low based on the closure of part of the HGLA, on the status of wild horses and burros on the HGLA, and adherence of geothermal exploration, development, and operation activities to applicable laws, regulations, formal orders, and the terms and conditions of BLM's standard lease form.

Alternative E – **No Action**

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA. The three pending lease applications would be denied.

Alternative E would not result in any impacts to wild horses and burros because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines.

4.15 GRAZING

4.15.1 Methodology

4.15.1.1 Management Goals

The FLPMA and the Public Rangelands Improvement Act of 1978 recognize livestock grazing as a principal use of public lands for the production of food and fiber, and the BLM manages livestock grazing through grazing allotments that are leased to cattle and sheep interests. The specific goals of the Livestock Grazing Element of the CDCA Plan are:

- Continue the use of the California Desert for livestock production to continue to satisfying the need for food and fiber from public land.

- Use livestock grazing as a tool to change or improve vegetation for meeting livestock needs as well as other management objectives as set forth in the Plan.

- Maintain lands that are in good to excellent condition at these production levels. Those lands in poor to fair condition will be improved by the application of appropriate management prescriptions to regulate livestock grazing within the framework of multiple use and sustained yield.

- Improve vegetation use by improving distribution of livestock through the use of range improvements and specific management prescriptions which will be fully developed and implemented with Allotment Management Plans (AMPS).

- Conduct specific monitoring procedures of condition and trend to determine the necessary grazing adjustments to meet management goals.

The corresponding Multiple-Use Class L management guidelines pertaining to livestock grazing state:

- Grazing will be allowed subject to the protection of sensitive resources. Support facilities such as corrals, loading chutes, water developments, and other facilities, permanent or temporary, may be allowed consistent with protection of sensitive resources.

- Manipulation of vegetation by chemical or mechanical means will not be allowed, except for site-specific needs.

4.15.1.2 Impact Criteria

Potential geothermal development impacts to grazing resources could occur if implementation of the Haiwee RFD scenario was to result in a loss of more than 10 percent of the AUMs supported by a given allotment.

The corresponding impact risks are ranked on a high-to-low risk scale.

High
If the action results in significantly higher loses than 10 percent of the AUMs;

Medium
If the action results in moderately higher losses than 10 percent of the AUMs; and

Low
If grazing losses are 10 percent or less of the AUMs.

4.15.2 Direct/Indirect Impacts

4.15.2.1 General Impacts

The entire HGLA is subject to grazing permits. The potential impacts to livestock grazing from geothermal exploration, development, and utilization could include temporary disturbance from construction activities, loss of vegetation that would temporarily decrease the amount of available forage for livestock, and disruption of livestock movement. Based upon the Haiwee RFD scenario, up to 384 acres of grazing lands would be temporarily impacted, followed by the long-term loss of 276 acres following initial reclamation. Exploration activities could also have a temporary effect on grazing patterns by shifting and/or intensifying livestock grazing over other areas, potentially resulting in impacts to native vegetation and wildlife in areas outside the authorized grazing areas.

Alternative A – Open the Entire HGLA for Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Exploration, Development and Leasing; Authorize All Pending Leases Within the HGLA

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Groundwater extraction for consumptive use during exploration, development, and production would be allowed, but controlled or restricted by stipulation. Limited groundwater use may be allowed under certain conditions

specified in Chapter 2 and in SA-HGLA-10. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to grazing privileges under Alternative A are discussed above, and are considered low. The degree of actual impacts would depend on the locations of future RFD facilities. The potential 384 acres reduction in available grazing lands could be distributed through two existing grazing allotments (Tunawee Common and Lacey-Cactus-McCloud) that overlap the HGLA. There is 2,408 acres (four percent) of the Tunawee Common Grazing Allotment, and 1,449 acres (three percent) of the Lacey-Cactus-McCloud Grazing Allotment, overlap with the three pending noncompetitive lease application areas CACA-043993, CACA-043998 and CACA-044082. If the Haiwee RFD scenario would be fully implemented, future geothermal development would result in the disturbance and loss of access to 384 grazing acres, or less than one percent of each of the allotments.

It should be noted that, under BLM regulations, grazing allotment permits are held subject to other uses of the public lands. If the BLM approves other (non-emergency) uses that would limit grazing within existing allotments, the BLM issues the permit holders two years notice of the planned reduction in the allotment. Since even at full build-out BLM's RFD scenario would disturb only a small percentage of acreage within the allotments, the impacts of Alternative A on the grazing resources with the Tunawee Common and Lacey-Cactus-McCloud grazing allotments are considered low. At full build-out the Haiwee RFD facilities would only occupy approximately one percent of the HGLA. In the event that future geothermal activities or facilities would result in potential conflicts with existing grazing privileges, the BLM would stipulate appropriate, project-specific onsite mitigation measures.

Alternative B – **Close the Entire HGLA to Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Closed and Unavailable for Geothermal Exploration, Development and Leasing; Deny Authorization of All Pending Leases Within the HGLA**

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications.

Alternative B would not result in any impacts to grazing on the HGLA because no geothermal development would occur within the HGLA.

Alternative C – **Open the HGLA to Geothermal Exploration, Development and Leasing; with No Surface Occupancy (NSO) Allowed in Sensitive Areas; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Leasing; Authorize All Pending Leases within the HGLA**

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the HGLA under restrictions of the No Surface Occupancy (NSO) stipulation NSO-HGLA-1. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres, and offer competitive leases for the approximately 18,000 acre balance of BLM-administered lands.

The foreseeable and potential impacts to grazing privileges under Alternative C are similar to those discussed under Alternative A. Although not expected to be an issue since grazing privileges are held subject to other authorized uses, Alternative C contains NSO requirements for specific areas of the HGLA, which could resolve potential conflicts between existing grazing privileges and future geothermal leases and activities.

Alternative D – **Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have Designated Areas within the HGLA Open and Available for Geothermal Leasing; Amend the CDCA Plan to have Designated Areas within the HGLA Closed and Unavailable for Geothermal Leasing; Authorize All Pending Leases Within the HGLA**

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, 13,773 acres would be closed and the remaining acres would be open in this alternative. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to grazing privileges under Alternative D would be generally similar as those discussed for Alternatives A and C. However, Alternative D could reduce potential impacts to existing grazing privileges in the areas that are closed to leasing.

Alternative E – No Action

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA. The three pending lease applications would be denied.

Alternative E would not result in any impacts to grazing privileges because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines.

4.16 RECREATION

4.16.1 Methodology

4.16.1.1 Management Goals

The CDCA Plan's Recreation Element lists the following goals:

- Provide a wide range of opportunities within resource capabilities for engaging in recreational activities for all desert users.
- Provide recreational management and facilities consistent with sound visitor and resource protection practices, with emphasis on conserving desert resources that have special scenic, historic, scientific, or recreational values.
- Protect desert users and minimize conflicts among recreationists and users of other desert resources.
- Enhance the enjoyment of the recreation experience and aid resource protection by increasing understanding and knowledge of the California Desert's resources and uses. Pursue this goal through public involvement in volunteer efforts, interpretation and environmental education programs, community outreach efforts, and other programs.

- Monitor and evaluate visitor use and preferences and adjust BLM programs to meet changing needs where appropriate.

- Provide for off-road-vehicle recreation use where appropriate in conformance with FLPMA, Section 601, and Executive Orders 11644 and 11989.

The corresponding relevant Multiple-Use Class L management guidelines for recreation state:

- This class is suitable for recreation which generally involves low to moderate user densities. Recreation opportunities include land sailing in dry lakes and non-competitive vehicle touring and events only on "approved" routes of travel.

4.16.1.2 Impact Criteria

The potential impacts from exploration and geothermal development to the recreational resources within the HGLA and vicinity are assessed with respect to two criteria. Potential impacts to recreation could occur if RFD 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 risks of impacts are ranked on a high-to-low scale:

High
If there are significant impacts on the above criteria;

Medium
If there are moderate impacts on the above criteria; and

Low
If there are minor or no impacts on the above criteria.

4.16.2 Direct/Indirect Impacts

4.16.2.1 General Impacts

This section describes the potential impacts to recreational resources and programs associated with the Haiwee RFD scenario. These potential impacts are assessed with respect to the goals of the Recreation Element of the CDCA Plan stated above.

Recreational resources are valued for the opportunity to participate in outdoor recreation activities in a natural, scenic setting. Geothermal leasing could result in a 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. Noise, vibration, dust, visual impacts, and odor from geothermal energy exploration, development, and operations, could disrupt the recreational enjoyment of the area. Similarly, views of construction equipment, or the addition or change of industrial structures such as pipelines, power lines, and generating facilities conflict with the natural background of many of these recreational resources, and lead to a low to medium, long-term aesthetic impact.

Intermittent noise associated with construction, visual impacts, and the temporary loss of access for recreational use during the exploration phase could result in a low risk of a significant and temporary impact on the recreational experiences available within the HGLA and vicinity.

Geothermal development including construction of well pads and wells, storage yards and staging areas, geothermal plants and associated transmission and pipelines lines as well as roads could also temporarily limit the amount of land available for OHV use, driving for pleasure, hiking, photography, rockhounding, hunting, primitive camping, dual sport motorcycle and equestrian events, rock climbing, and wildlife viewing. During certain phases of construction (i.e., pipeline construction), access via designated routes of travel may require use of alternate routes for short periods of time. Signage and public notices concerning such temporary route closures would serve to reduce conflicts with recreational users by directing them to areas unaffected during these construction periods.

Most OHV vehicles gain access to the HGLA via Gill Station Road and various unimproved roads. Geothermal development in the area is not expected to significantly restrict or reduce access to public lands with OHVs.

4.16.2.2 Impacts by Alternative

<u>Alternative A</u> – **Open the Entire HGLA for Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Exploration, Development and Leasing; Authorize All Pending Leases Within the HGLA**

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Groundwater extraction for consumptive use during exploration, development, and production would be allowed, but controlled or restricted by stipulation. Limited groundwater use may be allowed under certain conditions specified in Chapter 2 and in SA-HGLA-10. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres.

Opening the HGLA to geothermal development would require a long-term commitment of up to 276 acres of BLM, state, and private lands, which would subsequently become unavailable for recreational uses for the life of the geothermal leases.

Alternative A would likely impact dispersed recreational opportunities in the immediate vicinity of land disturbance activities. The primary effect would be the change of the recreational experience on larger scale activities such as OHV use of existing roads in the area. Short-term impacts to recreation within the HGLA could primarily result from all phases of the construction process. Activities associated with the upgrade of existing roads, construction of new roads and well pad sites, and setup of the well rigs could temporarily alter use of roads for the duration of the construction activities. Conflicts with recreational users could occur when construction vehicles travel to and from construction sites. Construction vehicles would be parked off-road in designated staging areas to minimize conflicts with access to recreation areas during construction. Where possible, based on the locations of suitable geothermal resources, the siting of construction sites will be located away from designated recreational routes of travel to minimize conflicts with other users of public lands. Since cross country travel is not permitted on the BLM-managed portion of the HGLA, only designated routes of travel would be potentially affected. The development of new roads could also increase public land access, and generate additional roads and trails in previously un-roaded landscapes.

Due to the temporary nature of construction activities, the relatively small number of people who use the area, and availability of adjacent alternative areas, the effects of the proposed action on the recreational resources would not be considered significant. In addition, there are no parks or other Federal, State, or county facilities in the immediate area. It is not anticipated that the recreational experience and use of the Coso Range Wilderness Area, would be significantly affected. This wilderness area is located approximately one mile north-east of the HGLA.

Under the full RFD scenario, the geothermal facilities would cause the long-term loss of up to 276 acres of land, or approximately one percent of the total HGLA. With the inclusion of the BMPs described in Appendix A, the anticipated impacts to recreation resources would be mitigated to the greatest extent feasible. The resulting degree of impact is judged to be low to medium.

Alternative B – Close the Entire HGLA to Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Closed and Unavailable for Geothermal Exploration, Development and Leasing; Deny Authorization of All Pending Leases Within the HGLA

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications.

Alternative B would not result in any recreational impacts because no geothermal development would occur within the HGLA.

Alternative C – Open the HGLA to Geothermal Exploration, Development and Leasing; with No Surface Occupancy (NSO) Allowed in Sensitive Areas; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Leasing; Authorize All Pending Leases within the HGLA

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the HGLA under restrictions of the No Surface Occupancy (NSO) stipulation NSO-HGLA-1. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres, and offer competitive leases for the approximately 18,000 acre balance of BLM-administered lands.

The foreseeable and potential impacts to recreational activities in the HGLA under Alternative C would be similar to those described under Alternative A. However, Alternative C has NSO requirements for some areas which could reduce potential conflict between recreational and geothermal activities. Although dependent on the specific locations of the Haiwee RFD facilities, the impacts under Alternative C are considered low.

Alternative D – **Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have Designated Areas within the HGLA Open and Available for Geothermal Leasing; Amend the CDCA Plan to have Designated Areas within the HGLA Closed and Unavailable for Geothermal Leasing; Authorize All Pending Leases Within the HGLA**

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, 13,773 acres would be closed and the remaining acres would be open in this alternative. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to recreational activities in the HGLA under Alternative D would be similar to those described under Alternatives A and C. However, Alternative D closes part of the HGLA which could resolve potential conflicts between recreational and geothermal activities. The impacts under Alternative D are considered low.

Alternative E – **No Action**

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA. The three pending lease applications would be denied.

Alternative E would not result in any recreational impacts because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines.

4.17 AREAS OF SPECIAL DESIGNATION

4.17.1 Methodology

4.17.1.1 *Management Goals*

The goals of the Areas of Critical Environmental Concern (ACEC) Program are to:

- Identify and protect the significant natural and cultural resources requiring special management attention found on the BLM-administered lands in the CDCA;
- Provide for other uses in the designated areas, compatible with the protection and enhancement of the significant natural and cultural resources; and
- Systematically monitor the preservation of the significant natural and cultural resources on BLM-administered lands, and the compatibility of other allowed uses with these resources.

4.17.1.2 *Impact Criteria*

Potential impacts associated with the Haiwee RFD scenario are analyzed in the context of the degree to which they have:

- Conflict with management goals and objectives set forth by the BLM in order to categorize, protect, and manage special designation areas;
- Conflict with conservation goals for the area; or
- Result in proposed land uses that are incompatible with existing or adjacent special designated areas.

4.17.2 Direct/Indirect Impacts

4.17.2.1 *General Impacts*

Congressionally-designated areas are typically withdrawn from geothermal development. Administrative designations are not automatically withdrawn from geothermal development; however, activities likely to affect the resources and values identified for protection under these designations would be precluded.

According to the CDCA Plan/West Mojave Plan, the Rose Spring ACEC is located on BLM Multiple Use Class (MUC) public lands (Class L). MUC Class L protects sensitive, natural, scenic, ecological, and cultural resource values. Lands within the WEMO area that are designated as MUC Class L are "managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished." For MUC Class L lands, geothermal electrical generation facilities may be allowed pursuant to licenses issued under 43 CFR Section 3250, et seq., and after NEPA requirements are met.

4.17.2.2 *Impacts by Alternative*

Alternative A – **Open the Entire HGLA for Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Exploration, Development and Leasing; Authorize All Pending Leases Within the HGLA**

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Groundwater extraction for consumptive use during exploration, development, and production would be allowed, but controlled or restricted by stipulation. Limited groundwater use may be allowed under certain conditions specified in Chapter 2 and in SA-HGLA-10. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts to areas of special designation under Alternative A are rated low. The potential for impacts to the Rose Spring ACEC will be determined in future NEPA assessments and permitting studies for site- and project-specific proposals. An area such as the Rose Spring ACEC, along with a sufficiently large buffer zone, would be protected from development and adverse impacts, either via responsible siting or by stipulation. Leases issued under Alternative A would have the appropriate stipulations, conditions of approval, and BMPs to minimize impacts to special designated areas. As such the effects of geothermal exploration, development, utilization, and ultimate reclamation on Rose Spring ACEC would be expected to have no adverse impacts.

Alternative B – **Close the Entire HGLA to Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Closed and Unavailable for Geothermal Exploration, Development and Leasing; Deny Authorization of All Pending Leases Within the HGLA**

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications.

Alternative B would not result in any impacts to special designated areas because no geothermal development would occur within the HGLA.

Alternative C – Open the HGLA to Geothermal Exploration, Development and Leasing; with No Surface Occupancy (NSO) Allowed in Sensitive Areas; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Leasing; Authorize All Pending Leases within the HGLA

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the HGLA under restrictions of the No Surface Occupancy (NSO) stipulation NSO-HGLA-1. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres, and offer competitive leases for the approximately 18,000 acre balance of BLM-administered lands.

The foreseeable and potential impacts to areas of special designation associated with Alternative C would be generally similar as those for Alternative A. However, Alternative C contains NSO requirements which will limit or avoid geothermal lease impacts to the Rose Spring ACEC. As such, no impacts to areas of special designations under Alternative C are expected.

Alternative D – Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have Designated Areas within the HGLA Open and Available for Geothermal Leasing; Amend the CDCA Plan to have Designated Areas within the HGLA Closed and Unavailable for Geothermal Leasing; Authorize All Pending Leases Within the HGLA

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, 13,773 acres would be closed and the remaining acres would be open in this alternative. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

Alternative D would close specific areas of the HGLA to geothermal leasing to limit or avoid geothermal lease impacts to the Rose Spring ACEC. As such, no impacts to Rose Spring would be expected under Alternative D.

Alternative E – No Action

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA. The three pending lease applications would be denied.

Alternative E would not result in any impacts to special designated areas because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines.

4.18 TRAFFIC/TRANSPORTATION

4.18.1 Methodology

4.18.1.1 *Management Goals*

The CDCA Plan's Motorized Vehicle Access Element seeks to manage motorized vehicle access on public lands, and designate areas for appropriate vehicle access. To these ends, the CDCA Plan seeks to constrain access to balance public and private needs, to avoid adverse impacts to desert resources, and to use maps, signs, and published information to alert users to motorized vehicle access situations (CDCA Plan, 1980, as amended).

The Multiple-Use management guidelines for Class L areas such as the HGLA address motorized vehicle access and transportation as follows:

- New roads and ways may be developed under right-of-way grants or pursuant to regulations or approved plans of operation. Motorized vehicle use will be allowed on existing routes of travel until designation of routes is accomplished.

- Vehicle use on some significant dunes and dry lakebeds is allowed.

- Periodic or seasonal closures or limitations of routes of travel may be required.

- Access will be provided for mineral exploration and development.

4.18.1.2 *Impact Criteria*

The following criteria were used to determine impacts to the transportation network and traffic flows. Potential impacts could occur if an alternative were to:

- Disrupt or improve the existing transportation patterns and systems;
- Worsen or improve the existing level of service (LOS); and
- Change existing levels of traffic safety.

More specifically, physical changes such as construction activities, construction-related traffic on local roads, population and labor force changes, and closing, rerouting, or constructing new roads could disrupt existing conditions. In addition, on roadways that have no history of exceeding their design capacities, an alternative could create significant impacts if it increased traffic to the point that the traffic exceeded design capacities. Such increases could worsen the existing LOS on roadways in and around the HGLA. Furthermore, an alternative could create traffic safety risks if its activities or components conflicted with a community's emergency vehicle routes, or if it featured designs and uses that were incompatible with traffic management policies. Such risks could also impact the transportation network and traffic flows.

The potential risks of impacts are ranked on a high-to-low scale:

High
If there are significant impacts on the above criteria;

Medium
If there are moderate impacts on the above criteria; and

Low
If there are minor or no impacts on the above criteria.

4.18.2 Direct/Indirect Impacts

4.18.2.1 *General Impacts*

Table 4.18-1 presents the projected number of vehicle trips for each phase of the Reasonably Foreseeable Development (RFD) scenario including exploration, construction, and operation and maintenance activities. During these reasonably foreseeable activities, increased vehicle traffic to the HGLA impacts the existing transportation network and traffic flows to varying degrees. The increase in vehicular traffic would be directly proportional to the number of vehicles used to transport employees between their residences, the program site(s), and program-related businesses that provide goods and services. Vehicular traffic would include personal as well as commercial vehicles. While it is difficult to quantify future traffic patterns and how many more vehicles, including visitor traffic, would use local and trunk roads, it is possible to base projected traffic estimates on the RFD scenario. For clarity, Table 4.18-1 estimates project-related vehicular traffic for the maximum build-out scenario, including drilling 20 temperature gradient wells and 22 production/injection wells per 30-MW geothermal plant.

It is important to note that while the data in Table 4.18-1 reflects the maximum number of workers likely to be needed during each development phase, the number of personal vehicles is a conservative estimate based on the assumption that employees will carpool. The number of personal vehicles, and thus the number of trips, might double upon realizing the full RFD scenario.

Should BLM open the land for geothermal exploration, development, and utilization, the number of vehicles and vehicle trips would approximate those presented in Table 3.15-3. Using the above data, during construction of the first and second geothermal plants, workers would use 115 and 127 personal vehicles to access the HGLA on a daily basis, respectively. During exploration, environmental permitting, and operational activities, the 54 personal vehicles that workers would use to access the HGLA would not be expected to substantially impede existing traffic flows along US 395 and feeder roads. More specifically, many of these personal vehicles (21) would belong to operations workers, who would be long-term residents of nearby communities and whose vehicles would be part of the area's existing traffic flows.

Construction activities would include 115 and 127 personal vehicles, of which 86 and 95 personal vehicles would be added to the existing traffic flows in and around the HGLA. To estimate these vehicles' impacts on existing traffic flows, it is important to identify which directions the construction traffic would flow during weekday mornings and weekday evenings. Based on the social and economic conditions analyses presented in Section 3.16, 25 percent of the construction workers would be residents of the socioeconomic study area (SSA) and their vehicles would be part of the area's existing traffic flows. The remaining 75 percent, approximately 256 and 281 construction workers, would not be residents of the SSA. Thus, 87 production/injection well workers and 22 makeup well workers would commute from locations outside of the SSA to the HGLA.

Table 4.18-1 Total Projected Traffic Generated During Each Development Phase for Two 30-MW Geothermal Plants

Development Phase	Laborers [1]	Duration	Personal Vehicles (PV)[2]		Construction Vehicles (CV)		PV Trips	CV Trips
			Vehicles	Trips/Day [3]	Tractor Trailers	Trips/Well		
Exploration	60	2 years	20	2	20[4]	30	20,800[5]	600
Environmental Permitting	40	18 months	13	2	N/A	N/A	468[6]	N/A
Construction								
Geothermal plant Production/Injection Wells	116	5 years	40	2	22	30	104,000[7]	660
Makeup Wells (1 well every three years)	29/well	5 months	10	2	10	30	20,000[8]	300
Operation and Maintenance	62	30 years	21	2	15[9]	4[10]	327,600[11]	60
Total Trips Generated							**474,488**	

1 Based on Section 3.16, Social and Economic Conditions.

2 The number of personal vehicles (PV) assumes that the workers will carpool, with three workers per vehicle.

3 These values assume workers will make one trip to the site in the morning, remain on-site during the day, and make one trip home in the evening.

4 Based on the Truckhaven EIS, one tractor trailer was needed for each exploration well. Thus, 20 tractor trailers would be needed for the HGLA's maximum of 20 exploration wells, i.e., temperature gradient wells.

5 This value assumes 40 vehicle-trips per day, five days per week, for 104 weeks.

6 This value assumes that BLM and contractor personnel will visit the site for one day during each month.

7 This value assumes 80 vehicle-trips per day, five days per week, for three years.

8 This value assumes 20 vehicle-trips per day, five days per week, for five months, equaling 2,000 PV trips. Replacing one well every three years for 30 years equals 10 wells, and thus 20,000 PV trips.

9 Based on the Truckhaven EIS, this value assumes one major maintenance overhaul every three years, or 10 overhauls during the power plant's lifetime. The overhauls might include using a drill rig or a coiled-tubing unit for cleaning downhole scaling that might build up on the inside wall of a well. Thus, over the 30-year lifetime, this value assumes 10 drill rigs might be used. Additionally, this value assumes that every six years, a crane or boom truck would be used to remove and replace the power plant's pumps. Again, over the 30-year lifetime, pump removal and replacement would include using five cranes or boom trucks. In sum, it is assumed that 15 tractor trailers would be needed to transport the 10 drill rigs and five cranes to and from the power plant site.

10 This value assumes that the tractor trailer driver would travel to and from the site twice, once to deliver the drill rig and crane, and once to retrieve the drill rig and crane.

11 This value assumes 42 vehicle-trips per day, five days per week, for 30 years.

Of these 256 construction workers for the first plant and 281 construction workers for the second plant, 60 percent, or 154 workers and 169 workers, would find transient accommodations in Kern County. All of these workers would be expected to find accommodations in and around the City of Ridgecrest, which has adequate hotel availability and lies approximately 40 miles southeast of the HGLA. Thirty percent would be expected to find transient accommodations in Inyo County, which also has adequate hotel availability and RV spaces. The remaining 10 percent would be expected to find transient accommodations in San Bernardino County.

The 154 construction workers staying in and around the City of Ridgecrest would add an estimated 51 personal vehicles to the US 395 corridor between the HGLA and the City of Ridgecrest. During weekday mornings, these construction workers would travel west through the City and north along US 395 to reach the HGLA. During weekday late afternoons, the workers would leave the HGLA, travel south along US 395, and east into and around the City. The 169 construction workers would add an estimated 56 personal vehicles to the US 395 corridor and follow a similar route as for the first plant's construction workers.

The construction workers staying in Inyo County would add an estimated fewer personal vehicles to the existing traffic flows along US 395. During weekday mornings, these construction workers would travel south along US 395 to reach the HGLA. During weekday late afternoons, the workers would leave the HGLA and travel north along US 395 to reach their accommodations in Olancha and Lone Pine.

The workers commuting from San Bernardino County would add fewer personal vehicles to the SR 178 and US 395 corridors than would the workers staying in Inyo County. During weekday mornings, these construction workers would leave San Bernardino County and travel west along SR 178 to the City of Ridgecrest. As these workers enter the City, their travel routes would follow those of the 154 and 169 workers above. During weekday late afternoons, the workers' trips from the HGLA would follow those of the Ridgecrest-bound workers.

With regard to the impact on existing traffic flows, exploration, environmental permitting, and construction activities would add 148 personal vehicles to the US 395 corridor in the vicinity of the HGLA for the first plant's construction and 160 personal vehicles for the second plant's construction. More specifically, the first plant's 341 total construction workers would use 115 personal vehicles; the second plant's 375 total construction workers would use 127 personal vehicles. Exploration workers would use an additional 20 personal vehicles, which would represent a negligible increase relative to the existing traffic volumes along US 395 and feeder roads. The project's increase in personal vehicles in the Ridgecrest and San Bernardino County areas would represent a negligible increase relative to the 2007 traffic volume along SR 178. SR 178 extends in an east-west direction on the City of Ridgecrest's east side. Though the existing LOS is unknown at intersections along Ridgecrest Boulevard, which extends in an east-west direction between Jack's Ranch Road and the Kern County line, the project would not be expected to substantially disrupt traffic flows or worsen the existing LOS. In addition, the project's personal vehicles would represent a negligible increase relative to the existing traffic volume along US 395 at the Inyo County-Kern County line. The existing LOS at this county line is LOS D. A negligible increase in the traffic volume would not be expected to worsen existing conditions to LOS E or LOS F.

Adding the project's personal vehicles north of the HGLA would represent a negligible increase in US 395's existing traffic volumes at the Olancha and Lone Pine intersections. The existing LOS at the Olancha intersection is LOS D, with the Lone Pine intersection operating at LOS B. While Inyo County's 2009 Regional Transportation Plan projects increases in traffic volumes at these intersections, it shows no change between the existing LOS and the future LOS at these intersections. Similarly, increasing traffic volumes by a negligible amount would not be expected to substantially change the existing LOS at these intersections.

Should the project's personal vehicles travel off of US 395, and along SR 190 and/or SR 136, they would increase existing traffic volumes by a negligible amount at the SR 190-SR 136 intersection, and along SR 136 approaching US 395. The existing LOS for both locations is LOS A. Inyo County's 2009 Regional Transportation Plan shows no change between the existing LOS and the future LOS in these two locations. The negligible increase in traffic is not expected to disrupt existing LOS A conditions at these two locations.

In addition to the personal vehicles above, BLM officials and consultant staff would use 13 personal vehicles. It is assumed that BLM officials would be long-term residents of the three-county SSA and that their personal vehicles would already be part of the area's existing traffic flows. Additionally, it is assumed that consultant staff would rent personal vehicles from locations near the HGLA. In this way, these rental vehicles would also already be part of the area's existing traffic flows.

In sum, even at the simultaneous build-out of the two 30-MW geothermal plants, the resultant traffic increases would be negligible relative to the existing traffic flows at the locations discussed above. The existing transportation network and traffic flows would accommodate program-related personal vehicle traffic with only negligible to minor impacts on existing LOS conditions.

While the number of personal vehicles would not be expected to substantially disrupt traffic operations in and around the HGLA, the program-related increase in vehicle trips gives cause for safety concerns. More specifically, each day, most of the program's labor force, if not all of it, would travel along US 395 to access the HGLA. Since 2005, most of the injuries and fatalities on Inyo County roadways have occurred on US 395 (Inyo County 2009). Given the duration of the exploration and construction activities, and because most of the construction workers would commute from outside of the SSA, workers would be expected to gain familiarity with US 395's features and traffic patterns, and adjust their driving behaviors accordingly. Based on existing traffic volumes, safety concerns could escalate with implementation of the Proposed Action if appropriate mitigation and management measures are not taken.

With regard to construction vehicle traffic, because exploration and construction activities would occur during different years, program-related tractor trailer traffic is not an additive function. As such, the program would use 20 tractor trailers during exploration; 32 tractor trailers during construction, which includes makeup/replacement well activities; and 15 tractor trailers during operation and maintenance activities.

To gauge maximum traffic impacts, routing 32 tractor trailers between the HGLA and southern origins and destinations, particularly in and around the City of Ridgecrest, would be expected to have a moderate adverse impact on city and county roadways. Existing truck traffic accounts for 26 percent of the vehicle miles traveled in Kern County. The California average for truck traffic vehicle miles is 10 percent (Kern County 2007). Additionally, traffic congestion exists along SR 178 through the City of Ridgecrest and Inyokern. In these communities, SR 178 is routed along streets that are primarily used for local trips. Routing truck traffic through these communities could cause delays at intersections. However, the delays would not be expected to reduce LOS conditions below LOS D, which the County seeks to maintain as a minimum LOS.

Additionally, safety risks could arise from US 395's four-lane facility traversing the HGLA, particularly considering the number of tractor trailers that opening the land for leasing would add to this roadway segment. The number of light or medium trucks would add a minimal amount of vehicle trips relative to tractor trailer trips. However, light or medium trucks might also contribute to safety risks along US 395's four-lane facility.

4.18.2.2 *Impacts by Alternative*

Alternative A – **Open the Entire HGLA for Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Exploration, Development and Leasing; Authorize All Pending Leases Within the HGLA**

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Groundwater extraction for consumptive use during exploration, development, and production would be allowed, but controlled or restricted by stipulation. Limited groundwater use may be allowed under certain conditions specified in Chapter 2 and in SA-HGLA-10. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres.

Impacts to traffic volumes and the transportation network surrounding and accessing the HGLA under Alternative A would be considered low. More specifically, the project's personal vehicle traffic would be expected to represent a negligible increase in the region's traffic flow. LOS conditions would be expected to approximate existing conditions in and around the HGLA. This assessment is based on the projected levels of adverse impacts to the existing transportation patterns and systems, to the existing levels of service on public roads and highways, and to highway safety.

Alternative B – Close the Entire HGLA to Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Closed and Unavailable for Geothermal Exploration, Development and Leasing; Deny Authorization of All Pending Leases Within the HGLA

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications.

Alternative B would not result in any impacts on the existing and future transportation network and traffic flows along US 395, SR 136, SR 178, and SR 190 because no geothermal development would occur within the HGLA.

Alternative C – Open the HGLA to Geothermal Exploration, Development and Leasing; with No Surface Occupancy (NSO) Allowed in Sensitive Areas; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Leasing; Authorize All Pending Leases within the HGLA

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the HGLA under restrictions of the No Surface Occupancy (NSO) stipulation NSO-HGLA-1. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres, and offer competitive leases for the approximately 18,000 acre balance of BLM-administered lands.

The foreseeable and potential impacts under Alternative C would be expected to be similar as those described for Alternative A since the RFD remains the same under both alternatives, and the impacts, if any, occur outside the boundaries of the HGLA.

<u>Alternative D</u> – Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have Designated Areas within the HGLA Open and Available for Geothermal Leasing; Amend the CDCA Plan to have Designated Areas within the HGLA Closed and Unavailable for Geothermal Leasing; Authorize All Pending Leases Within the HGLA

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, 13,773 acres would be closed and the remaining acres would be open in this alternative. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential impacts under Alternative D would be expected to be similar to those expected under Alternatives A and C since the RFD remains the same under all alternatives, and the impacts, if any, occur outside the boundaries of the HGLA.

<u>Alternative E</u> – No Action

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA. The three pending lease applications would be denied.

Alternative E would not result in any impacts to the transportation network and traffic flows because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines.

4.19 SOCIOECONOMICS

4.19.1 Methodology

4.19.1.1 *Management Goals*

The CDCA Plan currently has no applicable management goals for social or economic conditions, or environmental justice issues. As such, the various federal policies discussed in Chapter 1 provide the direction for assessing impacts. On the county level, the Economic Development Element for the Inyo County General Plan (2001) addresses primarily tourism and redevelopment. However, one of the County General Plan goals and related policy is relevant to the Haiwee program:

> "***Goal ED-4:*** Actively encourage the expansion of existing industry of all types (including resource industries, manufacturing and service industries), and actively recruit new businesses that will bring new jobs to the County; ***Policy ED-4.1***: Mining Industry: Support the continued operation of existing mining activities within the County as well as new mining in appropriate areas, subject to each operator meeting all applicable safety and environmental laws, regulations, and County policies."

With regard to environmental justice, Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (CEQ 1997) focuses federal attention on the environmental and human conditions of minority populations, and calls on agencies to develop strategies to achieve environmental justice as part of this mission. The USEPA subsequently developed guidelines to assist all federal agencies to develop strategies to address the issue (USEPA 1996). Federal agencies are required to address disproportionally high and adverse human health and environmental effects in their programs, policies, and activities on low-income or minority populations. Since the proposed action is a federal action, it is subject to environmental justice analysis.

4.19.1.2 Impact Criteria

The potential risks of direct and indirect impacts affecting socioeconomic and environmental justice issues are assessed with respect to nine criteria. Potential impacts to socioeconomic and environmental justice issues could occur if the Haiwee RFD actions were to:

- Affect expenditures or incomes within the socioeconomic study area (SSA) associated with the program;
- Induce growth or population concentrations;

- Displace a portion of residences in a community;
- Create a demand for additional housing that could not be sustained within the SSA;
- Cause a decrease in SSA or regional employment;
- Displace or disrupt businesses in the SSA;
- 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 impacts affecting socioeconomic resources and environmental justice issues from exploration, geothermal development, electric power production, or reclamation uses a high-to-low scale. The following definitions of high, medium, and low are used in assessing these potential risks:

High
If there are significant impacts on the above criteria.

Medium
If there are moderate impacts on the above criteria.

Low
If there are minor or no impacts on the above criteria.

4.19.2 Direct/Indirect Impacts

4.19.2.1 General Impacts

Local socioeconomic impacts from implementation of the Haiwee RFD would arise primarily from the preliminary feasibility studies, exploration activities, construction, and subsequent operation of the two geothermal plants. These activities would create in the short term new jobs and produce new local expenditures that would, in turn, generate secondary economic impacts in the form of additional jobs and income ("ripple effects"), increased public revenue, and an increase in the local population. This population growth could then impact community infrastructure such as housing, schools, domestic water systems, etc., as well as social well-being. However, in the context of the broader regional, state, and national energy economy goals and policies, the development of the HGLA would yield benefits such as low-emission electric power while avoiding many of the typical external social costs associated with fossil fuel plants.

Socioeconomic impacts would be felt throughout the broader region of Inyo, Kern, and San Bernardino Counties. However, these impacts would be focused on conditions in the Haiwee SSA. Some exploration and construction workers would most likely come from outside the three-county area because many skills needed for implementation of the Haiwee RFD are specific to the geothermal sector. If hired from outside the SSA, temporary workers are likely to relocate into the SSA during the exploration and construction phase to minimize their commutes. Jobs related to permanent operations and maintenance in the long term would be expected to remain in the SSA, either because workers were residents at the time of their hire, or subsequently moved into the SSA.

Because future Haiwee geothermal facilities would be located in Inyo County, most of the public revenue benefits, in the form of property taxes and royalty revenues, would be received by jurisdictions within Inyo County. The County would also be the recipient of 25 percent of the resulting federal royalties. Increased sales tax revenues would accrue to the jurisdictions where workers reside and obtain retail goods and services; both short-term and long-term workers are expected to reside in each of the three counties.

Potential social impacts associated with the geothermal facilities are most likely to result from local perceptions about threats and opportunities that may affect lifestyles and perceptions of community quality of life (Freudenburg, et al. 1994; Leistritz, et al. 1981). Such perceptions often stem from 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). However, since geothermal facilities already exist within the region, particularly at Coso, local residents are familiar with geothermal power generation.

As voiced during public scoping meetings, water resources are of key interest to local residents. The concern regarding impacts of the proposed action has been so common as to view water as a widespread community concern. With regard to potential social disruption resulting from the in-migration of individuals who do not share community values, the level of long-term in-migration is expected to be insignificant. Moreover, there is no reason to assume that these individuals would have different values and attitudes from those in the existing community. In fact, they may be attracted to these communities based on their perception of compatible community values. However, the temporary in-migrating construction workers, who could number about 226 individuals during the peak of construction, could represent a noticeable, but temporary change in the community population. Based on the projected impacts under the Haiwee RFD scenario, the additional facilities would be unlikely to 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 Haiwee social environment. It is more likely that residents in adjacent communities will find the RFD acceptable because it will offer employment, generate taxes, and be consistent with other existing geothermal facilities nearby.

Employment and Wages

A combination of expert opinion and public studies was used to estimate employment and wages that could be generated as a result of implementation of the Haiwee RFD scenario. A workforce schedule was produced entailing the preliminary field studies, seismic testing, development of temperature gradient wells, environmental permitting, plant construction, development of production and injection wells, and facility operation.

Seismic Testing and Temperature Gradient Wells

Employment levels for the initial phases of seismic testing, and for drilling and testing of the exploratory temperature gradient wells, were estimated based on representative levels typical for access road construction and well development. These phases were assumed to last about two years total. Figure 4.20-1 shows that, during this two-year phase, an average of about 40 jobs would be created, with potential peaks of up to about 60 workers. The actual timing of these phases, and the corresponding employment levels from month to month, could vary from this preliminary assessment as local conditions merit, and testing regimes change in response to new information produced by that testing. However, the overall employment averages and peaks are considered reasonable best estimates. The start date of January 2013serves as a representative date, and actual dates of commencement could be later, in which case the schedule shown in Figure 4.20-1 would be delayed accordingly.

Environmental permitting

Environmental permitting will occur if the testing phase reveals that proceeding to plant development could be feasible. The Haiwee RFD assumes it will be feasible; if it is not, then no further action would occur. Environmental permitting would include preparation of project- and site-specific EISs and EIRs as well as numerous permit studies and applications. The manpower schedule estimates a total of 18 months to obtain the permits required to allow construction of the geothermal plants and drilling of the production and injection wells. An average of 40 employees, including consultants and BLM personnel, would be typical for this phase. The BLM personnel would be located in the three-county SSA. Consultants would likely be based in offices outside the SSA but performing periodic site visits; local hiring for this phase would be minimal.

Construction of geothermal plants and production/injection wells

Published materials, such as Hance (2006), relied on analysis of geothermal projects that are not directly comparable to the conditions and assumptions in the Haiwee RFD. These sources were evaluated and considered, but ultimately primarily expert opinion was used to project the impacts for this peak activity period.

Drilling of the production and injection wells would occur 24 hours per day, seven days per week, and in two 12-hour shifts with a staff of about 13 persons during the day shift, and five on the night shift, each working five shifts per week for five months. Incorporating allowances for holidays, vacations, and sick time, the average number of employees needed to drill one well and place it in operation would be about 29 workers. Based on the RFD assumptions, and four wells being drilled at a time, an estimated 116 employees would be required over a period of about five years. However, due to shift work, the actual number of employees on-site at any one time would be less than 116.

Operation and maintenance

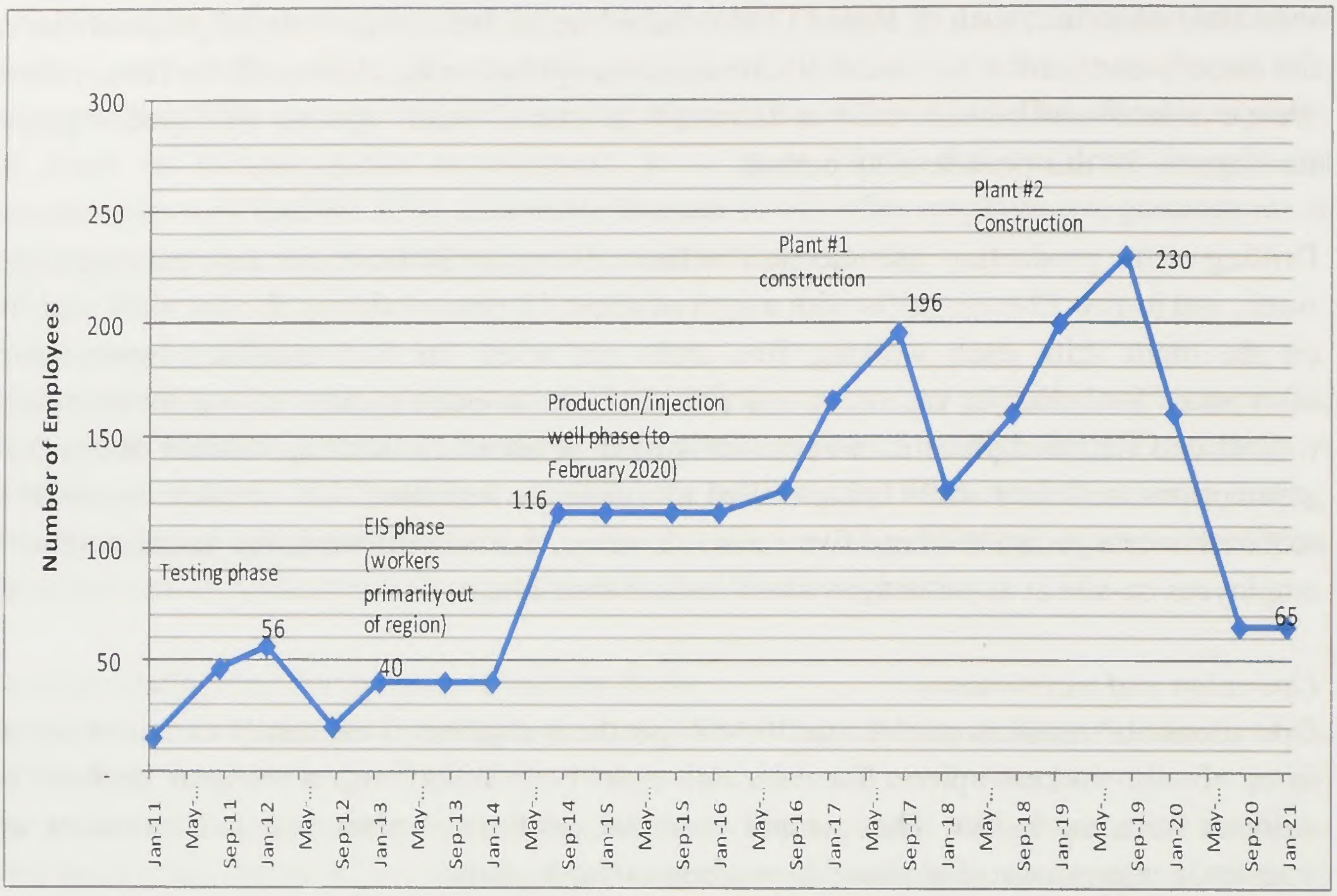
Operations and maintenance of two 30 MW geothermal plants is estimated to require a work force of six workers apiece, for each two eight hour shifts, with a skeleton staff of four workers for a third shift. Thus, employment for geothermal plant and well operation and maintenance is estimated at about 62 workers for both plants.

Additional makeup production and injection wells are projected to be needed to replace worn-out wells and upgrade configuration. Based on the RFD projections, these wells are expected to be needed at a rate of one new well during every three years of operation. This would require a work force of about 29 workers for five months every three years, on average.

Personnel costs

Costs of staffing the Haiwee RFD facilities are important personnel costs and are a major part of the total cost of the program, because wage and salary payments would be a main stimulus to the local economy. In contrast, local purchases of equipment and services to conduct exploration, development, and operation and maintenance are expected to be relatively minor compared to total program purchases, because the specialized equipment needed for these activities is expected to be purchased from outside the SSA and the larger three-county area, thereby not increasing local sales or creating any local economic ripple effects.

Figure 4.19-1 Reasonable Foreseeable Development, Projected Employment Schedule



Source: POWER Engineers and Economic Planning Resources 2010.

The estimates of wages and salaries used herein are based largely upon the current "prevailing wages" for construction in California. These are published by the Office of the California Director of Industrial Relations (2009) for construction trades, which are used herein for plant and road construction. Union wage rates for journeyman well drillers (Southern California District Council of Laborers 2006) were used for both temperature gradient and production and injection well development, increased somewhat due to the need for well engineers on-site. Environmental permitting rates were used based on knowledge of average salaries for consultants and BLM personnel. In all cases, the assumptions were that crew averages would approximate journeyman wages. The assumed average wage rates and resulting monthly costs by type of worker are shown in Table 4.19-1.

Using the assumptions in Figure 4.19-1 and Table 4.19-1 the total cost of wages/salaries/benefits, from initiation of geothermal development through the first year of operation of both plants, was estimated at $124 million. Annual operation and maintenance labor costs were estimated at $7.5 million.

Table 4.19-1 Assumptions for Labor Costs, Proposed Action, Monthly Basis

	Base/hr	Hrs/wk	% non-specialized skill, SSA available	Monthly water incl. overtime at 150%, 200%, Sun./holidays	Total including 50% overheads to contractors, plus 50% union, 25% non-union benefits	Monetizable benefits at $5/hr union, $3 non-union	Plus benefits at 50% union, 25% non-union
Surveyors	$ 28	50	50%	$ 3,046	$ 6,854	$ 3,296	$4,570
Water well driller, seismic tester only	$ 30	50	25%	$ 3,246	$ 7,344	$ 3,514	$4,896
Water well drillers, including engineer	$ 35	60	20%	$ 6,216	$ 13,986	$ 6,516	$9,324
Well tester	$ 35	50	25%	$ 3,808	$ 8,568	$ 4,058	$ 5,712
Engineer	$ 50	50	10%	$ 5,440	$ 10,200	$ 5,590	$ 6,800
Geothermal plant operations	$ 34	40	50%	$ 6,433	$ 14,474	$ 6,633	$ 9,649
Geothermal plant construction	$ 33	60	30%	$ 5,861	$ 13,187	$ 6,161	$ 8,791
Environmental Planner	$ 45	40	25%	$ 7,740	$ 14,513	$ 7,860	$ 9,675

Source: POWER Engineers and Economic Planning Resources 2010.

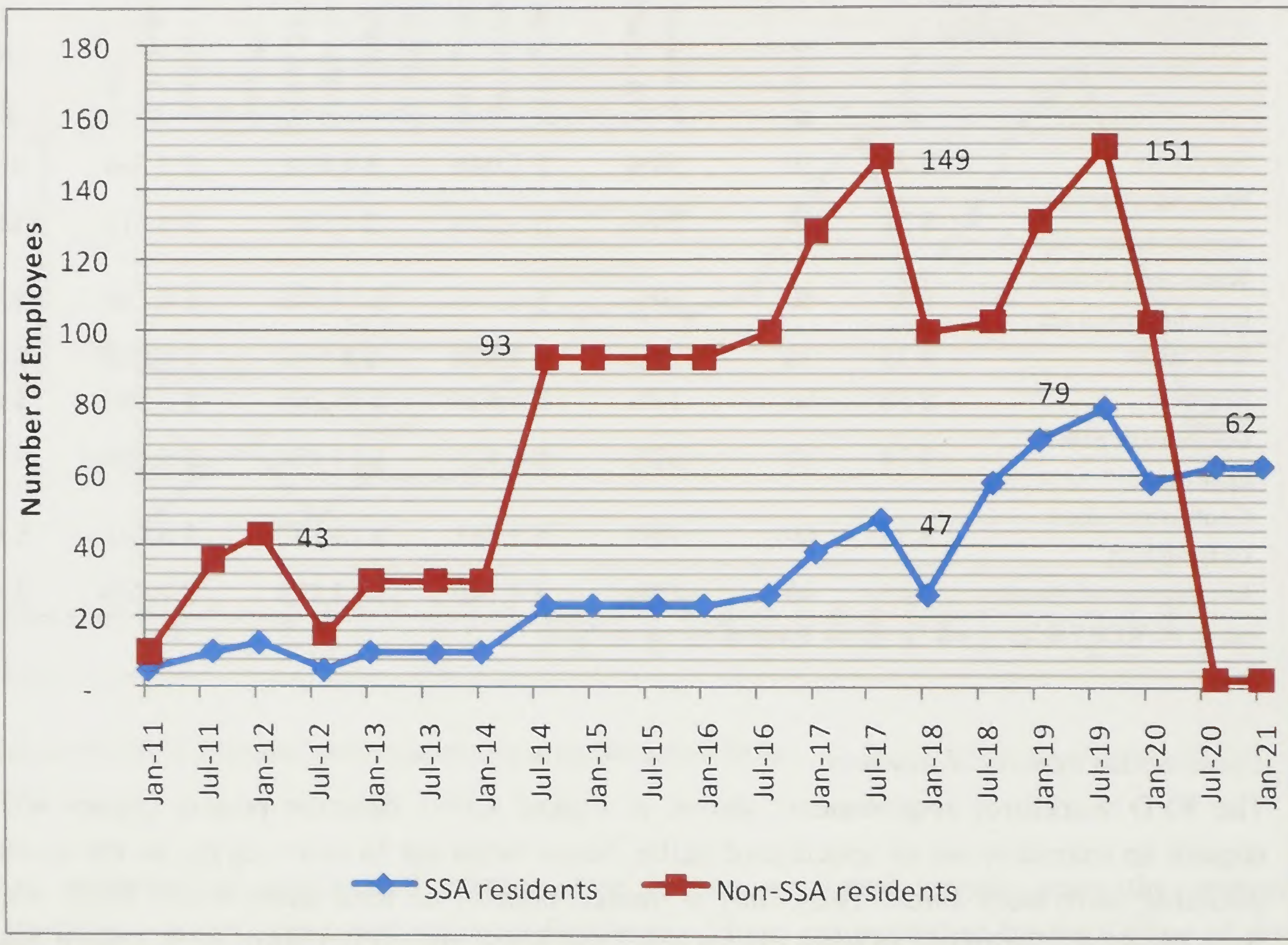
Local versus non-local workers

The RFD workforce requirements shown in Figure 4.19-1 describe project phases which require an extensive set of specialized skills. Some skills are in short supply in the locally-available SSA work force. Thus, only a limited number of local hires would likely come from the SSA. Estimates of local versus non-local hires, shown in Figure 4.19-2, were based on the proportions of potentially available local workers (Table 4.19-1) and the workforce schedule shown in Figure 4.19-1. These estimates indicate that, at the peak of construction, about 150 workers would be hired from outside the SSA. In regard to housing impacts, these workers are expected to relocate temporarily to the SSA, living in transient housing (hotels or RV parks) but leaving for other work opportunities when their jobs are completed. At the peak, about 80 workers are projected to be residents of the SSA at the time of their hire.

Total costs

The RFD scenario does not include any estimate of expenditures for plant construction or operation. However, information in Hance (2005) includes alternative methods for estimating total costs, including a range of $3,100-3,500 per kW (2005 dollars), and an average labor to total cost ratio of 41%. These costs, using "burdened" labor costs (wages, salaries, benefits, and contractor overheads assumed at 30%) indicate a total cost estimate through construction of about $204-327 million (2010 dollars). Using the average of these two estimates, results in a total estimate of costs through construction of $265 million.

Figure 4.19-2 Local versus Non-Local Work Forces



Source: POWER Engineers and Economic Planning Resources 2010.

Operation costs have also been estimated in Hance (2005) as comprised of 42-74% labor costs. Using total burdened labor costs (wages, salaries, benefits, and 30% for overheads), and a midrange of 58% of total operations and maintenance costs accounted for by labor, the annual operating costs would be about $17 million (2009 dollars).

Annual and cumulative construction costs were derived by allocating all costs according to the workforce schedule shown in Figure 4.20-1. The resulting year-by-year cost estimates are shown in Table 4.20-2. Since the first geothermal plant is assumed to be in operation during the construction of the second geothermal plant, the actual costs for construction and operation the first plant would be somewhat higher than shown.

Table 4.19-2 Estimated Development Costs by Year

	Annual Construction Cost ($millions 2010)	Cumulative Construction Cost
2011	$10,595,361	$10,595,361
2012	$6,426,470	$17,021,832
2013	$11,270,422	$28,292,254
2014	$19,689,724	$47,981,978
2015	$31,476,747	$79,458,725
2016	$33,610,264	$113,068,989
2017	$48,694,230	$161,763,219
2018	$34,796,962	$196,560,181
2019	$48,753,542	$245,313,723
2020	$20,208,760	$265,522,483
2021 (operational)	**$16,807,468**	
Total Construction cost	**$265,522,483**	

Source: POWER Engineers and Economic Planning Resources 2010.

Impacts on Employment and Income

This socioeconomic assessment used the input-output economic model *Impact Analysis for Planning* (IMPLAN, trademark IMG, Inc.) to estimate secondary employment impacts of the program. The model produces multipliers that allowed calculation of the secondary (or "ripple") impacts of the program arising from the re-spending of payments to labor and direct suppliers during the individual exploration, permitting, construction, and operation phases.

In order to estimate ripple impacts, the injection of income into the Kern-Inyo County region from the RFD scenario was estimated. This estimate included labor costs of wages/salaries/benefits, and direct purchases of goods and services needed for development (including but not limited to aggregate, equipment rental and leasing, security, etc.). Included in the direct purchases are increased local expenditures for hotel/RV facilities, restaurants, groceries, etc. by the temporarily in-migrating exploration and construction workers.

IMPLAN is only estimated on a county-wide basis because most of the necessary data for the model are available only county-wide. For this assessment, the primary geographic used was Kern and Inyo Counties, combined. Very little impact is likely to occur in Inyo County, even though the proposed HGLA lies in the county. Inyo County is much smaller (10,742 jobs in 2008 versus 372,421 in Kern County), has a much less diversified economy, and is less able to serve local demand in comparison with the Mojave Desert portion of Kern County. Much of the local demand for goods and services, as well as the source of most permanent workers, would be the Ridgecrest area in Kern County rather than in Inyo County.

San Bernardino County was not explicitly included in the IMPLAN analysis since (1) very few workers or purchases of goods and services are expected from San Bernardino County, (2) all but a small fraction of its economic activity is distant from the Haiwee SSA, and (3) local-markets serving economic activity in the San Bernardino County portion of the SSA, located in the Trona/Red Mountain/Searles Valley, is very limited. The secondary effect estimates developed for Inyo and Kern Counties can be applied to the entire three-county area as well as the Haiwee SSA, with little error.

The results of the analysis focus on employment impacts because the employment opportunities provided by both on-site activity and its ripple effects would also cause increases in transient and permanent populations. However, benefits to personal incomes are also notable as further indicators of potential benefits of the Proposed Action.

Because development of the Haiwee RFD facilities would, in general, require relatively specialized labor and materials not in plentiful supply in Kern and Inyo Counties, and because their economies, particularly that of Inyo County, are relatively small and rely heavily on imported goods and services, the results show very small ripple effects of BLM's proposed action on employment or labor income. These results are shown in Table 4.20-3, and indicate employment "multipliers" generally in the range of 1.15 to 1.22 for the Kern-Inyo County area as a whole. Even smaller multipliers would likely apply if only the SSA were considered since the SSA is even less able to capture the impacts of worker and program purchase spending than the broader Inyo-Kern County area.[12]

However, a high-side bias in secondary employment projections for the SSA is useful for a worst-case impact assessment because it shows slightly high-side population and housing impacts, which help substantiate the conclusion of low socioeconomic impact.

Impacts on Population and Housing

Impacts on population and housing will differ markedly during the subsequent operation phase from, the prior years of exploration, permitting, and construction.

During operation, all permanent employees at the geothermal plants and ancillary facilities are expected to be either SSA residents at the time of their hire, or to move into the SSA to work. In contrast to the temporary construction workforce, operations workers moving to the area (assumed to be half the work force, or about 30 workers) are assumed to bring families and household members with them. The same would be true for workers who may in-migrate to take service-sector, or secondary, jobs supported as a result of the program, estimated to total about 15 workers (Table 4.20-2). Thus, operations-phase increases in housing demand will be for year-round rental or ownership housing; only limited demand for transient

[12] In more urbanized economies for less specialized projects, multipliers can range upwards of 2.0 to 3.0.

accommodations would occur, largely due to business visitors. Since local supplies of rental and for-sale housing are ample for this level of in-migration, no adverse impacts to the local housing market should be evident. By comparison, temporary workers would be expected to seek primarily transient housing such as hotels or RV parks, with only limited reliance on rental accommodations, except perhaps during the summer peak demand for transient housing. As shown in Figure 4.20-2, at the peak of construction about 151 construction workers would be working on the Haiwee program and living in the SSA, compared to a maximum of only 43 workers during the permitting and exploration phases.

Table 4.19-3 Selected Results of IMPLAN model for Kern and Inyo Counties (combined)

Peak year (2019)	
Impact Type	**Employment**
On Site	217
Direct Effect from Purchases	121
Total On Site and Direct from Purchases	338
Ripple Effects	
Indirect Effects	14
Induced Effect	38
Total Ripple Effect	52
Total Effect	390
Implied Multiplier	1.15

Operating (2021+)	
Impact Type	**Employment**
On Site	65
Direct Effect from Purchases	11
Total On Site and Direct from Purchases	76
Ripple Effects	
Indirect Effects	1
Induced Effect	14
Total Ripple Effect	15
Total Effect	91
Implied Multiplier	1.20

Total All Years	
Impact Type	**Employment**
On Site	1,184
Direct Effect from Purchases	665
Total On Site and Direct from Purchases	1,849
Ripple Effects	
Indirect Effects	78
Induced Effect	326
Total Ripple Effect	404
Total Effect	2253
Implied Multiplier	1.22

Inyo County currently has an off-season availability of about 65-80 hotel rooms and about 100 RV spaces. In contrast, there is very little availability of hotel rooms and RV parking during the April-October peak visitor period. Under present conditions available hotel and RV spaces in Inyo County are likely to be scarce during peak months. this effect is judged as insignificant, however, because hotel availability in Ridgecrest is very adequate (currently totaling 1,100 rooms with about 35% vacancy in the off-season from November to March), with only rare and brief times when occupancy nears 100 percent during the April-October peak visitor season.

This housing and population impact assessment provides a range of potential outcomes based on two different assumptions about the proportion of production/injection well workers who will choose to relocate permanently into the SSA. The first assumption is that all of these workers would choose to remain in transient housing. An alternative assumption is that 80% would ultimately choose to relocate permanently, bringing dependents and renting or owning homes.

The primary constraint upon transient accommodation availability would occur during construction, when an average of about 120 construction workers (ranging from a minimum of 90 transient workers to a maximum of 150 workers at the peak of construction) will require hotel rooms or RV spaces. This level of demand could result in some excess demand if the demand would occur entirely in Inyo County, particularly during the April-October peak season. However, the presence of ample room availability in the Ridgecrest area, and even a small availability in the San Bernardino portion of the SSA, would ensure that all workers can find accommodations in or near the SSA. Based on the current distribution of available accommodations, about 45 workers are predicted to reside in Inyo County, 90 in

Kern County, and 15 in San Bernardino County transient accommodations at the peak of construction.[13]

During the years before operation, the primary geothermal development related housing demands will be for transient housing. However, the ripple effects from the economic stimulus provided by the RFD scenario would result in a variety of additional service-sector jobs, as described previously under "Employment and Income." While most of those jobs would be filled by local residents, the overall increase in labor demand would induce some in-migration of service-sector workers who may intend to remain in the area. Their numbers are estimated at 52 secondary jobs during the peak construction years (Table 4.20-2). This influx would also look for more permanent rental or ownership housing, for which adequate supplies exist in the SSA.

In sum, the impact on housing and population from BLM's Proposed Action is likely to be very minimal during the years before construction begins, less than moderate during the peak of construction, and again minimal during operations because operations housing demand will be for rental or ownership housing, supplies of which are ample in the SSA. Table 4.20-4 summarizes the results for the projected population and housing impacts.

Including temporary workers, the total population increase to the SSA in the peak year of construction is estimated at 283 persons, or 0.4% of the estimated 2009 population of the SSA. This increase would not last past the peak construction months. The operations phase would increase the SSA population by only 124 persons, all but an estimated three workers for periodic makeup well work, would be long-term residents.

Table 4.20-4 also shows the projections for the scenario of 80% of the in-migrating construction workers choosing to look for permanent housing. In this case, the number of workers seeking transient accommodations in the peak year would decline from about 150 to about 60 workers and impacts on hotel/RV availability would be negligible. Again, based on availability, the resulting impacts of this scenario on population and housing would remain low, representing only about a 0.6% increase to the SSA population.

[13] This peak in transient housing demand would be further reduced if more than the 20% of production/injection well drillers assumed to be local residents were increased. Since this component of the RFD is slated to last for about five years, many of the 93 in-migrating well-drilling workers (80% of the total workforce of 116, or 93 workers) would be likely to become long-term residents, establishing households and choosing rental or ownership housing, rather than transient accommodations.

Table 4.19-4 Population and Housing Impacts Summary, Proposed Action

Percent of Production/Injection Well Drillers Becoming Long-Term Residents	20 Percent		80 Percent	
	Peak Year (2019)	Annual Operation (2021+)	Peak Year (2019)	Annual Operation (2021+)
Population				
Temporary in-migrants (peak month) – no dependents	151	0	58	0
Jobs filled by long-term in-migrants				
Site jobs filled by long-term in-migrants	0	34	93	34
Number of secondary jobs (ripple effects), held by long-term in-migrants	52	15	52	15
Total jobs held by long-term in-migrants	52	49	145	49
Average household size	2.53	2.53	2.53	2.53
Total long-term in-migrants population	**132**	**124**	**425**	**124**
Plus temporary in-migrants (total permanent plus temporary population increase)	**283**	**124**	**425**	**124**
Likely split by area[1]				
South Inyo County	127	37	191	37
Northeast Kern County	127	75	191	75
Trona/Red Mountain/Searles Valley, San Bernardino County	28	12	42	12

Percent of Production/Injection Well Drillers Becoming Long-Term Residents	20 Percent		80 Percent	
	Peak Year (2019)	Annual Operation (2021+)	Peak Year (2019)	Annual Operation (2021+)
Housing				
Number of households				
Temporary (nearly all hotels and RV parks)	151	0	58	0
Likely split by area[1]				
South Inyo County	45	0	58	0
Northeast Kern County	91	0	17	0
Trona/Red Mountain/Searles Valley, San Bernardino County	15	0	35	0
Permanent (rental and ownership housing)	52	49	6	0
Likely split by area[1]				
South Inyo County	16	15	43	15
Northeast Kern County	31	29	87	29
Trona/Red Mountain/Searles Valley, San Bernardino County	5	5	14	5

[1]Assumed split: 30% to Inyo County, 60% to Kern County, and 10% to San Bernardino County.

Impacts to Public Services

The degree of potential adverse impacts to public services typically corresponds primarily to the level of population increase in their jurisdictions, and secondarily on employment and income increases, and the associated infrastructure demands compared to existing capacities or difficulty of expansion of services. Where "choke points" such as lack of excess capacity of schools, water systems, police and fire protection exist, significant adverse impacts can occur depending on the magnitude of increased demands.

Given the very low population impacts described for the HGLA, correspondingly low impacts on public services can be expected. As described in Chapter 3, Public Services, the SSA's public service providers generally do not exhibit shortages in excess capacity or ability to readily expand to service new demands. The only reported potential problems are for fire protection and sewage collection in the Ridgecrest area. Neither appears to be a serious constraint for geothermal development in the HGLA. Some funding problems for fire protection in the Ridgecrest area have resulted in minor staffing cuts. The Ridgecrest sewage treatment plant is approaching its rated capacity, but the City has published bids to begin new design for expansion in a timely manner. The lack of evident public service choke points, and the very low increases expected, results in a finding of no significant impact.

Impacts to Public Revenues

This finding of no significant impact on public services is somewhat mitigated by the general status of public finances for California State and local governments throughout California. Well before the 2007-09 recession, difficulties in funding what have been generally considered adequate public services were common throughout the state, and the SSA was no exception. As described in Chapter 3, the core issue appears to be structural problems in state funding mechanisms, which are likely to remain even as the current and expected economic recovery proceeds. This problem, however, applies not only to the proposed action, but to any development. This section describes the potential impact on tax revenues from the proposed action.

Current uncertainties in potential geothermal lease payments to Inyo County affect whether the proposed action leads to geothermal energy projects that "pay for themselves" in fiscal balances. This issue is important especially in light of the cross-jurisdictional nature of impacts of the proposed action. Inyo County would carry the full cost of road maintenance in the site vicinity, particularly to US 395, but most of the workers for the proposed action would live in Kern County where they would generate sales taxes, property taxes, hotel occupancy taxes, and various other revenues.

Royalty payments are required under the Energy Policy Act of 2005 which calls for 50 percent of the royalties from geothermal leases to be paid to the state, 25 percent to the county in which the lease area is located, and 25 percent to the BLM to operate its geothermal program. Of the monies paid to the state, 40 percent are paid by the state to Inyo County, pursuant to state statute (PRC §3821 and 3823). Numerous attempts have been made to eliminate the 25 percent share going directly to counties, and in the current fiscal year, the 2010 Department of the Interior Appropriations Bill, HR 2996, eliminated such payments to counties for budget year 2010. Local legislators are attempting to reconstitute the direct county share, but the future of the county shares is currently uncertain. Inyo County's 25 percent direct payment, arising from the Coso Geothermal Project, was $301,819 in 2007 and $246,746 in 2008 (Lake County News 2009). In addition, to the direct payments, the state-shared amount paid to Inyo County was $171,000 (Kevin Carunchio, County Manager, Inyo County, January 4, 2010, personal communication).

The amount of royalties that would be paid as a result of BLM's proposed action at the HGLA would depend on the market value of energy sales at the time such sales are made. Since those values would not occur until sales are made, and since market values cannot reliably be predicted that far in advance, only a very rough estimate is made herein, based on historical payments to Inyo County by the Coso development. State-shared royalty payments to Inyo County from BLM's proposed action would be $41,000 (2008 dollars, which are approximately equal to 2010 dollars). Since the Coso facility is rated at 270 MW, this impact estimate is based on pro-rating the state-shared payments to Inyo County from the 270 MW Coso geothermal facilities.

Property taxes would also accrue to Inyo County as a result of the proposed action. Based on the estimated construction cost of $265 million and the local 1% property tax rate, these taxes would amount to $2.65 million upon operation of both Haiwee geothermal plants. This estimate is in line with the valuation of the Coso plant of $1.2 billion (Inyo County Register 2008). The actual taxes paid would depend on the County Assessors valuation of sales as operation proceeds, but initially, constructed value would be likely to be the primary basis. In the years before either plant is in operation, assessments value of site improvements would also be made, likely in accordance with the costs of construction shown in Table 4.20-2. Possessory interest values may also be assessed during the earlier exploration and construction phases. The actual valuation of possessory interest, which is essentially the value of having the right to develop[14], is not attempted herein.

Using the IMPLAN model, the total state and local taxes generated by the Proposed Action are estimated to total $15.8 million over the 2011-2021 time period used for this impact analysis. These estimates would be in addition to property taxes described above. The IMPLAN model does not include taxes for special districts and many other taxing entities, however, many other types of taxes, and therefore these results are considered extremely low-side.

The IMPLAN model does not produce estimates of public costs with which to compare public revenues in order to estimated net fiscal benefits. Such a full fiscal analysis is beyond the scope of this EIS.

Table 4.19-5 IMPLAN Results for State and Local Tax Revenues Generated Under the Haiwee RFD*

Description	Employee Compensation	Indirect Business Tax	Households	Corporations	Totals
Dividends				$731,300	$731,300
Social Ins Tax - Employee Contribution	$44,525				$44,525
Social Ins Tax -	$191,560				$191,560

[14]According to the State Assessors Handbook, "...although publicly owned real property is generally either immune from taxation—in the case of federal property—or exempt from taxation—in the case of state and local government property—under certain conditions, the private, beneficial right to the possession of publicly owned real property is subject to separate assessment as a taxable possessory interest" (California State Board of Equalization 2002).

Description	Employee Compensation	Indirect Business Tax	Households	Corporations	Totals
Employer Contribution					
Indirect Bus Tax: Sales Tax		$3,081,709			$3,081,709
Indirect Bus Tax: Property Tax		$2,455,177			$2,455,177
Indirect Bus Tax: Motor Vehicle Lic		$60,892			$60,892
Indirect Bus Tax: Severance Tax		$1,916			$1,916
Indirect Bus Tax: Other Taxes		$614,979			$614,979
Indirect Bus Tax: S/L Non Taxes		$284,104			$284,104
Corporate Profit Taxes				$365,366	$365,366
Personal Tax: Income Tax [1]			$1,772,351		$1,772,351
Personal Tax: Non Taxes (Fines - Fees)			$218,867		$218,867
Personal Tax: Motor Vehicle License			$34,227		$34,227
Personal Tax: Property Taxes			$15,103		$15,103
Personal Tax: Other Tax (Fish/ Hunt)			$6,309		$6,309
Sales Tax on Non-local Project Purchases [2]		$5,956,906			$5,956,906
TOTAL STATE AND LOCAL TAX	**$236,085**	**$12,455,683**	**$2,046,857**	**$1,096,666**	**$15,835,291**

Footnotes:

*Based on an assumed 2011 to 2021 development period.

(1) Estimated by Economic Planning Resources based on incomes to transient workers and effective state income tax rate of 1% on those incomes.

(2) Estimated by Economic Planning Resources based on estimate of non-local purchases as the residual of total cost minus local project purchases and labor costs.

Source: Minnesota IMPLAN Group, Inc. Economic model used for analysis and RFD analysis by Power Engineers and Economic Planning Resources.

Alternative A – **Open the Entire HGLA for Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Open and Available for Geothermal Exploration, Development and Leasing; Authorize All Pending Leases Within the HGLA**

Under Alternative A the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, and 22,805 acres of BLM-administered lands or federal mineral estate would be made available for geothermal exploration, development, and utilization. Groundwater extraction for consumptive use during exploration, development, and production would be allowed, but controlled or restricted by stipulation. Limited groundwater use may be allowed under certain conditions specified in Chapter 2 and in SA-HGLA-10. Under this alternative the BLM would authorize the three pending non-competitive lease applications for 4,277 acres.

The foreseeable and potential socioeconomic impacts associated with Alternative A are discussed above. The data show that impacts to Inyo and surrounding counties from implementation of the Haiwee RFD will likely be an increase in employment (including secondary employment), economic benefits, and public revenues (as a result of royalty payments and property taxes). Other potential impacts may include a decrease in available housing or public services and are expected to be low and short-term based on the characteristics of the exploration and construction work force, and those of the long-term operations work force.

Alternative B– **Close the Entire HGLA to Geothermal Exploration, Development and Leasing; Amend the CDCA Plan to have the HGLA Closed and Unavailable for Geothermal Exploration, Development and Leasing; Deny Authorization of All Pending Leases Within the HGLA**

Under Alternative B, BLM-administered lands located within the HGLA would be closed to geothermal leasing, and the CDCA Plan would be amended to reflect that decision. Under this alternative the BLM would not offer competitive geothermal leases on any of the 22,805 acres of BLM-administered lands or federal mineral estate within the HGLA, and would deny the three pending non-competitive lease applications.

Under Alternative B there would be no socioeconomic or land use changes as a result of geothermal leasing in the HGLA or the greater CDCA.

Alternative C – **Open the HGLA to Geothermal Exploration, Development and Leasing; with No Surface Occupancy (NSO) Allowed in Sensitive Areas; Amend the CDCA Plan to have the HGLA Open and Available**

for Geothermal Leasing; Authorize All Pending Leases within the HGLA

Under Alternative C, the CDCA Plan would be amended to reflect the delineated HGLA as open to geothermal leasing for direct and indirect use, but with specific acreages of the HGLA under restrictions of the No Surface Occupancy (NSO) stipulation NSO-HGLA-1. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. Under this alternative, the BLM would also authorize the three pending non-competitive lease applications for 4,277 acres.

Impacts associated with Alternative C would be equal to or less than those of Alternative A because Alternative C would be essentially the same as the Alternative A in regards to the RFD scenario. Since the socioeconomic impacts of Alternative A were assessed as low, and the development likely to occur under Alternative C would be less than or equal to (but not greater than) those of Alternative A, the socioeconomic impacts of Alternative A are assessed as low.

Alternative D – **Selective Closure of Sensitive Resource Areas within the HGLA for Geothermal Exploration and Development; Amend the CDCA Plan to have Designated Areas within the HGLA Open and Available for Geothermal Leasing; Amend the CDCA Plan to have Designated Areas within the HGLA Closed and Unavailable for Geothermal Leasing; Authorize All Pending Leases Within the HGLA**

Under Alternative D, the BLM would close specific areas within the HGLA to geothermal leasing to protect sensitive resources while opening the remainder of the HGLA to leasing. Of the 22,805 acres of BLM managed lands or federal mineral estate within the HGLA, 13,773 acres would be closed and the remaining acres would be open in this alternative. In addition, based on public concerns regarding the use and limited availability of groundwater, groundwater extraction for consumptive use would be prohibited. The CDCA Plan would be amended to reflect the specific areas that are open and closed to geothermal exploration, development, and utilization. Under Alternative D, the BLM would also authorize the three modified pending non-competitive lease applications for 4,277 acres.

The socioeconomic impacts under Alternative D would be similar to those described for Alternative C, and would be assessed as low.

Alternative E – **No Action**

Under the No Action Alternative, the CDCA Plan would not be amended, and the existing plan decisions, stipulations, and allocations would not change as a direct result of this EIS process. The HGLA would remain under management of the current CDCA Plan, which does not identify the HGLA as open or closed to geothermal leasing, nor does it indicate the availability status of lands within the HGLA. The three pending lease applications would be denied.

Alternative E would not result in either positive or negative socioeconomic impacts because no geothermal development would occur within the HGLA under present CDCA Plan policies and guidelines.

4.20 CUMULATIVE IMPACTS

4.20.1 Introduction

CEQ regulations require that an EIS address cumulative impacts, which are defined as:

> *"...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."* (40 CFR 1508.7).

Cumulative impacts may result in significant impact to the environment, as degradation of important resources may result from the combined, incremental impacts of actions. Cumulative impacts can result from similar projects or actions, as well as projects or actions that have similar impacts.

The HGLA cumulative impacts analysis focuses on the natural resources, ecosystems, and social or human communities that could be affected by the incremental impacts from development of geothermal resources that might be associated with adoption of one the HGLA alternatives as evaluated in Chapter 4. This analysis builds on the direct and indirect impacts of the alternatives described in Chapter 2 of the EIS. The approach to the cumulative impacts analysis follows the principles outlined in the CEQ's "*Considering Cumulative Impacts*" (1997) and USEPA and Office of Federal Activities guidance entitled "*Consideration of Cumulative Impacts in EPA Review of NEPA Documents*" (1999).

4.20.2 Methodology

The BLM followed the steps below to develop the cumulative impacts analysis for the EIS:

Step 1: Define alternatives for the EIS.
The proposed action and alternatives are described in Chapter 2 of the EIS. Consideration of the impacts of past actions has been carried out as an integral part of the evaluation of the baseline, or affected environment defined and described in Chapter 3, and is reflected in the alternatives presented, as well as subsequent analysis.

Step 2: Define Present and Reasonably Foreseeable Future Projects and Actions.
A list of present and reasonably foreseeable actions was developed via consultation with government agencies, nongovernmental organizations, and knowledgeable private

entities, as well as through public scoping. These actions included projects, activities, and trends that could impact the human and environmental resources in each impact area.

Step 3: Incorporate the Direct and Indirect Impacts.
Direct and indirect impacts associated with geothermal development according to the RFD developed and evaluated elsewhere in the EIS are incorporated into the cumulative impacts analysis. Direct impacts are caused by implementing the proposed action or an alternative, and occur at the same time and place as the proposed Project. Indirect impacts are caused by the proposed action or an alternative, but are later in time or farther removed in distance and are still reasonably foreseeable.

Step 4: Determine the Potential Impacting Factors of Each Past, Present or Reasonably Foreseeable Future Project and Action.
For each action identified in Step 2, the BLM developed a description of the potential impacting factors, which are the mechanisms by which an action affects a given resource. Each impacting factor may be a component of more than one action or activity.

Step 5: Evaluate Cumulative Impacts.
The BLM evaluated cumulative impacts for each resource. The scope of the impact analysis was determined in Chapter 3 as described for each resource. The evaluation considers the impacting factors for the various resources and the incremental contribution of the proposed action to the cumulative impact.

- The following factors are used to judge the cumulative impact on a resource:
- Nature of the impact;
- Geographic or spatial extent of the potential impacting factor;
- Geographic or spatial extent of the resource;
- Temporal extent of the potential impacting factor;
- Regulatory considerations, for example, threatened and endangered species;
- Potential for effective mitigation of the impact; and
- Potential for recovery of the resource after removal of the impacting factor.

Step 6: Present the Cumulative Impacts Analysis.

The cumulative impacts for each resource are described in this Section of the EIS.

4.20.3 Past, Present and Reasonably Foreseeable Future Projects and Actions

The following discussions describe present and reasonably foreseeable future projects and actions in and around the HGLA, including renewable energy, water, highway, and mineral development projects. The analysis takes into account the effects of past actions, as represented by the baseline –the affected environment, as well as the impacts of the "no action" alternative. When combined with the impacts from the project alternatives, these projects and actions may contribute to cumulative impacts. While a distinct impact area for cumulative impacts and specific present and reasonably foreseeable future projects and actions are determined individually for each resource, collectively, the projects described below represent the major known and anticipated activities that might occur in the HGLA's vicinity.

As the discussions include projects in various stages of planning and development, it is likely that some of these projects will be completed as currently proposed while others will not. To be conservative, the cumulative impacts analysis assumes that all of the following projects will be built and in operation during the development and operating lifetime of the geothermal projects outlined in the HGLA RFD scenario. The BLM consulted the following agencies to identify the projects:

BLM – Ridgecrest Field Office;
BLM – State Office;
BLM – California Desert District;
China Lake Naval Air Weapons Station (NAWS);
Coso Operating Company;
Inyo County Planning Department; and
Los Angeles Department of Water and Power (LADWP)

Renewable Energy Projects

Renewable energy resources and projects are present throughout the HGLA region. Geothermal exploration-related facilities in the HGLA cumulative affects area have been approved by the state, BLM, and Inyo County, for example the Deep Rose Geothermal Exploration Project. The Coso Geothermal complex generates power on the China Lake NAWS. Several hydroelectric power generation facilities are located in the Owens Valley. Electricity generated at these facilities is generally routed towards population centers to the south, on transmission lines in the Owens Valley, or lines leading south from the Coso complex through the Naval Station and the Ridgecrest area. The West-wide Energy Corridor Programmatic EIS identifies energy corridors through the Owens Valley. The Renewable

Energy Transmission Initiative has also identified similar corridors. Additional transmission upgrades into and through the Owens Valley have been discussed for geothermal energy development in Western Nevada.

Geothermal Energy Projects

Deep Rose Geothermal Exploration Project

Deep Rose, LLC has obtained the necessary approvals to explore geothermal resources in southern Inyo County. The area of exploration is located near the center of the HGLA on state-owned lands in the southern McCloud Flat region in Section 16, Township 21 South, Range 38 East, Mount Diablo Base and Meridian (see Figure 2.1-1). They have received a BLM right-of-way to build a road for access to the proposed drilling site in Section 16 and to build a water pipeline should development occur. If a resource is located, Deep Rose, LLC would likely apply for permits for geothermal development.

Coso Geothermal Leasing Area

The Coso Geothermal Field is located in the NAWS, just to the east of the HGLA. The field's reservoir is in a Mesozoic granitic/metamorphic complex underlying the Quaternary Coso Volcanic Field. It currently produces approximately 200 MW from four geothermal plants. More than 100 wells have been drilled throughout the field, with production depths from 2,000 to 12,000 feet, and geothermal resource temperatures from 200° to 350°C (see Figure 2.2-1).

In 1987, the Coso Geothermal Field began generating electricity. Since then, improvements have resulted in more efficient use of the resource. Together with an annual drilling program, these improvements have helped keep the geothermal field producing above its contract capacity of 210 MW. Improvements to the field's injection system and injection augmentation are described below for the Hay Ranch project.

Solar Energy Projects

Currently, the California Energy Commission (CEC) is reviewing two proposed solar projects: the 2,012-acre Beacon Solar Power Project and the 3,920-acre Ridgecrest Solar Power Project. Both projects are located in northeastern Kern County.

Interest has also been expressed in solar energy development at the following locations:

Hay Ranch, about 700 acres near Coso Junction along U.S. Highway 395 – Terra-Gen Power LLC;

McNaughton Property, 1,400 acres east of Independence – AEI CASC Consulting;

Lone Pine Tribe, south of Lone Pine;

Wiley Trust properties, 7,000 acres in Charleston View;

Owens Lake, 57,600 acres; and

Owens Valley, 175,000 acres on LADWP lands

Wind Energy Projects

The BLM's Ridgecrest Field Office received applications from the following companies for initial exploration studies for two wind energy developments in southern Inyo County. These projects are located in and adjacent to the HGLA and would initially involve installing MET towers.

Debenham Energy LLC

16,364 acres on east and west sides of U.S. Highway 395 and Haiwee Reservoir in southwestern Inyo County, up to eight towers. This application has been withdrawn and is no longer pending.

RES America Developments

Environmental documents expected for the following two meteorological assessments for wind energy projects along U.S. Highway 395 in southwestern Inyo County: (1) Little Lake North – 13,754 acres, six towers; and (2) Little Lake South – 4,000 acres, three towers (see Figure 2.1-1).

Other Relevant Projects and Actions

A description of several other notable projects in the vicinity of the HGLA is included in this section. These projects have the potential to contribute to cumulative impacts when considered with the proposed action.

Los Angeles Department of Water and Power Haiwee Reservoir Seepage Recovery

The LADWP's North and South Haiwee Reservoirs are unlined and may leak water that infiltrates to the groundwater table. The amount of leakage is unknown. LADWP reportedly estimated the leakage rate to be approximately 900 acre-feet per year, based on the model calibration effort conducted for the 2006 numerical groundwater flow model. LADWP has stated that it will propose a future seepage recovery project that would pump the groundwater from an existing LADWP well (V817 or V816) just north of Hay Ranch through a 1,700-foot-long pipeline to the Los Angeles Aqueduct to the west. The well would be pumped at approximately 1.2 cubic feet per second, approximately 870 acre-feet per year. The area encompassed by the South Haiwee Reservoir and associated facilities extends approximately 2.5 miles south of the reservoir and adjacent to the northeast boundary of the HGLA.

Hay Ranch Water Extraction and Delivery System

The Coso Operating Company, LLC has recently constructed a groundwater extraction and pipeline delivery system from the Coso Hay Ranch to the water distribution station and injection system located at the Coso Geothermal Field. The project included an approximately nine-mile-long pipeline within a 50-foot-wide right-of-way across public lands located in the HGLA. The pipeline was constructed to convey water to the Coso Geothermal Project for supply of injection water to replace geothermal fluid that is evaporating from the geothermal project's cooling towers during the summer months. In addition to the pipeline, the project includes an associated electric power substation, pumping equipment, and holding tanks. Six acres of the project is located on private property, 32 acres are on BLM-managed public lands, and 16 acres are located on the China Lake NAWS (see Figure 2.1-1).

U.S. Highway 395 Improvement Projects

Caltrans has various improvement projects located along or on U.S. Highway 395. Most applicable in this analysis is the safety roadside rest area rehabilitation project at Coso Junction. In October 2008, Caltrans completed this rehabilitation project.

Gill Station Road Improvements

The Inyo County Department of Public Works proposes to improve a 5.5-mile-long section of Gill Station Road (also known as the Coso-Gill Station Road), from U.S. Highway 395 at Coso Junction to the China Lake NAWS' entry gate, just east of the HGLA boundary. The project would include realigning, widening, and repaving Gill Station Road.

Haiwee Ridge Pump Storage Project

Haiwee Ridge Hydro, LLC has proposed a 500 MW pump storage project involving a manmade reservoir in the Coso Mountains and water from the South Haiwee Reservoir. A Preliminary Permit has been requested from the Federal Energy Regulatory Commission. The proposed facility would purchase water from the Los Angeles Department of Water and Power to generate power during times of peak demand. The current proposal encompasses about 7 ¼ sections (approximately 4,640 acres) of BLM managed lands within the HGLA.

Mineral Development

Currently, pumice is the primary economically viable mineral resource in the area. There are many potential mineral development projects in the HGLA cumulative effects area.

4.20.4 Cumulative Impacts by Resource

Air Quality
Cumulative impacts on air quality must take into account past, present, and reasonably foreseeable actions and activities to evaluate whether the proposed project would have a cumulative effect on air quality.

Air quality impacts of past and present projects that are currently operating in the vicinity of the HGLA are accounted for in background concentrations of air pollutants as measured at the air monitoring stations located in Death Valley, Olancha, and Keeler. Table 3.2-3 summarizes these concentrations. The currently operating projects are also accounted for in the attainment status of the air basin, and attempts to quantitatively evaluate the cumulative construction and operating emissions would be speculative.

Cumulative construction impacts to air quality could result if construction activities for the projects above would occur simultaneously with construction in the HGLA. It is unlikely that all of the projects would be constructed at the same time. Quantitatively evaluating cumulative construction emissions would be speculative. During construction, all projects would be required to implement fugitive dust control measures to minimize cumulative impacts.

Cumulative operational impacts to air quality would result if cumulative projects that result in air emissions during operations have a significant impact on air quality. Through the air permitting process with the GBUAPCD, projects with operational emissions that degrade air quality would not be allowed. Most of the renewable energy projects identified above involve development of solar and wind projects, which, once constructed, result in minor amounts of air emissions from inspection and maintenance activities. Potential mineral development in the HGLA also has the potential for air emissions from operations associated with mineral extraction processes. However, as mentioned above, the cumulative impact from geothermal development in the HGLA to air quality is considered negligible. As such, combining the other existing or planned projects and activities in the HGLA with those related to geothermal development in the HGLA would result in negligible increases to air quality standards.

Noise
The cumulative impact of development in and around the HGLA would generate short-term, local noise. The majority of this noise would be expected to originate from the projects mentioned above. More specifically, should the CEC approve the two proposed solar energy projects on private land, the noise that these projects' construction vehicle and personal vehicle traffic streams would produce would add to that of the HGLA-related vehicles. The solar energy projects' on-site construction activities would also add to HGLA construction

noise. While it is unlikely that all of the projects would occur at the same time, construction vehicle, personal vehicle, and construction noise associated with Debenham Energy's proposed wind project would occur on both sides of U.S. Highway 395 and could add to the solar and geothermal projects' noise levels. Additionally, traffic and construction-related noise associated with RES America Developments' proposed wind project on 17,754 acres at Little Lake would be expected to impact a residential property situated less than one-half mile north of Little Lake. Furthermore, the Inyo County Department of Public Works' proposal to realign, widen, and repave a 5.5-mile section of Gill Station Road would also be expected to contribute to an increase in ambient noise levels.

It is important to note that the cumulative noise from multiple sources, such as well-drilling and grading equipment from both on- and off-site developments, is determined based on the addition of sound intensities from the sources instead of the addition of their sound pressure levels. The combined noise level of multiple sources is the logarithmic sum of the sound intensity of each source. For example, two construction equipment noise levels of 90 and 45 dBA result in a combined audible noise level of approximately 90 dBA. Drilling and testing wells would subject persons in close proximity to intermittent loud noises. However, none of the projects mentioned above would generate long-term, local noise.

Topography, Geology, and Seismicity

The cumulative impact of implementing the geothermal, wind, and water projects above, along with the proposed action or alternatives, would be expected to create local changes in topography and geology, and potentially increase micro-seismicity. Though the exact locations for any future developments are unknown, it would be expected that many of the projects would likely occur on relatively level terrain, which would minimize the need for cut and fill. However, should projects be proposed on terrain with relatively high relief, then those projects would require specific mitigation to address erosion, slope stability, and seismicity. The pump storage project, if completed, would clearly impact topography by the creation of a reservoir with its associated dams.

Concerning geology and seismicity, exploration and construction activities specific to the geothermal and wind projects would be expected to create local changes in these resources. However, the cumulative impacts to these resources in the HGLA and adjoining areas are expected to be minor. While geothermal projects proposed by Deep Rose LLC and BLM lease applicants would impact the HGLA's geology and add to the Coso Geothermal Field's impacts, these projects are not expected to create regional geological impacts or trigger seismic events. Similarly, the Coso Operating Company's recently completed pipeline and wind proponents' excavation and installation activities for wind tower foundations and placement are also not expected to create regional geological impacts or trigger seismic events.

Soils

Combining the anticipated impacts associated with the proposed action with impacts from other potential projects and activities in the area may create additive soil impacts. This combination of impacts could potentially generate other 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 topsoil to allow vegetation growth.

The probable increase in miles of new roads in the HGLA, as well as surrounding areas, from geothermal development and other projects and activities could result in an increase in OHV traffic, which would lead to increased soil erosion, especially during intense rainfall events. Unless properly mitigated and depending on the locations of the RFD facilities, the cumulative disturbance of soils from other projects could potentially contribute sedimentation to Haiwee Creek, Little Lake, and Haiwee Reservoir. However, it is anticipated that the cumulative impacts of soil erosion or sedimentation would be minor because of the generally required implementation of mitigation measures and lack of significant rainfall throughout the year. Flash flood events do cause significant erosion but, given the sparse existing vegetation cover, impacts from these natural events would not be exacerbated by the proposed activities in the HGLA. The cumulative impacts of activities associated with development in the HGLA would have a minor increase in soil erosion or sedimentation.

Water Resources

Other relevant groundwater extraction projects that may contribute to cumulative water resources impacts in the HGLA include the Coso geothermal plant, Hay Ranch Groundwater Extraction and Delivery System, Deep Rose Geothermal Exploration, and LADWP capture of groundwater seepage from the South Haiwee Reservoir. The cumulative impacts of implementing one or more groundwater development projects in Rose Valley depends on the pumping rate, project duration, extraction location, and schedule relative to other groundwater development projects in the valley. As discussed above, additional water would likely be needed to sustain operation of the RFD assumed geothermal plants during a 30-year useful life. At least some of the water supply would likely come from groundwater extraction in the Rose Valley, which is also being used for operation of the Coso geothermal plant. Though these pending projects might be required to extract any groundwater from outside the HGLA, they would be the largest users of groundwater in Rose Valley. Based on the calculated recharge rates and observed impacts at the Coso geothermal facilities, the combined groundwater withdrawal is predicted to cause the lowering of the groundwater table and decrease in water available to wells, wetlands, and Little Lake. Since all alternatives proposed tie water consumption to the safe yield in the basin, it is unlikely that any geothermal leasing will negatively impact water resources.

Geothermal Well Drilling, Plant Construction, and Dust Control

Low to moderate short-term impacts are expected from groundwater extraction to support geothermal well drilling, facilities construction, dust control, and other minor water needs associated with geothermal exploration and development under the HGLA RFD scenario. This prediction is based on the generally short-term nature of well drilling or construction activities, likely minor water needs associated with individual well drilling projects, or routine dust control measures, and, the apparent lack of significant impact from comparable current activities including groundwater extraction for domestic uses in the valley and groundwater extraction for the surface mining operations in the valley.

In the event that a number of concurrent geothermal drilling or construction projects are undertaken in the valley, cumulative impacts could be more significant. It should be noted that groundwater extraction for the Hay Ranch groundwater diversion project, which has started operation at an initial extraction rate of approximately 3,000 acre-feet per year, is not expected to reduce groundwater flow towards the Little Lake Ranch property at the south end of the valley by more than 10 percent. 10 percent was identified as a critical protective threshold in the draft EIR (MHA 2008) so that stipulations are in place curtailing pumping if certain drawdown triggers are reached in nearby wells. This same protective threshold is included in all of the action alternatives that authorize leases.

The estimated amount of groundwater needed for a geothermal well drilling project is approximately 12 acre-feet (ac-ft) of water per well. This amount is considerably less than the extraction rate of 790 ac-ft/yr estimated via the Revised Groundwater Flow Model (Stephens & Associates 2011) to be sustainable for the Hay Ranch groundwater diversion project. In this way, it appears that wells could be drilled without measurable impacts to groundwater resources.

Extraction to Augment Geothermal Reservoir Fluid Levels

In contrast to the projected low impacts from geothermal well drilling and similar short-term projects, long-term extraction to augment geothermal reservoir fluid levels would likely have significant impact on sensitive receptors and, in particular, to surface water features at the south end of the valley on the Little Lake Ranch property. The Hay Ranch groundwater diversion project is currently operating at a permitted extraction rate of 3,000 acre-feet per year, comprising a significant fraction of the estimated 5,100 acre-feet per year annual recharge to the Rose Valley aquifer. In addition, LADWP has a proposal to extract approximately 870 acre-ft of groundwater on property they own at the north end of Rose Valley. The timeframe for the LADWP project has not been identified. As discussed above, potentially significant impacts to the groundwater resources of Rose Valley are predicted for even modest long-term pumping to augment geothermal reservoir fluid levels.

Appendix G presents a groundwater flow modeling analysis. Results indicate that groundwater extraction for just one or two geothermal plants would likely reduce groundwater flow to Little Lake Ranch. This extraction would exceed the 10 percent flow reduction threshold identified in the HMMP for the Hay Ranch project (MHA 2008). The analysis presented in Appendix G indicates that a 30-year pumping rate of approximately 1,150 acre-feet per year could be sustained. This rate would not reduce groundwater flow to Little Lake by more than 10 percent, absent any other extraction projects. The analysis also indicates that drawdown from multiple extraction projects is additive, depending on the location and timing of the extraction. Considering the Hay Ranch project, it is unlikely that significant long-term groundwater extraction, without restraints, can be sustained without impacting the surface water at Little Lake Ranch. Therefore, the water production stipulations of the action alternatives should minimized long term impacts from geothermal development and make them minor.

Biological Resources

Several developments have already disturbed or removed vegetation communities in the HGLA. These developments include roads, transmission lines, the Coso Geothermal complex, the Hay Ranch water pipeline project, and grazing. In addition to these developments, it is highly likely that planned renewable energy projects would disturb or remove additional vegetation communities in the region. Should the planned renewable energy projects be constructed, they would alter the landscape of the undeveloped desert. The increased traffic and ground disturbance associated with these planned projects might also introduce non-native, invasive weed populations to the HGLA and adjoining areas. Furthermore, the West-wide Energy Corridor Final Programmatic EIS (DOE 2008) identified a portion of the HGLA as a utility corridor, raising the possibility that future transmission projects could also be developed in the area.

Non-native, invasive weed populations not only displace native plants, but can also impact wildlife. More specifically, these weed populations can degrade the quality and quantity of forage available to native wildlife. In this way, wildlife habitats may become fragmented and degraded. Fragmentation causes the core wildlife area size to decrease and reduces the patches that are uninterrupted by human disturbance. As fragments increase, edge areas increase. This phenomenon reduces habitat connectivity, may favor the habitat generalist wildlife species over the desert-adapted species, and could threaten species richness or diversity at regional scales (Rogers et al.1996). However, based on the limited amount of habitat modification relative to the total HGLA acreage, fragmentation and loss of habitat is not expected to significantly impact the diversity or abundance of the HGLA fauna.

Concerning listed species, the accelerated loss of habitat, combined with the increased potential for losses of burrowing or slow-moving species, such as the Mojave ground squirrel and desert tortoise, would represent the most significant cumulative impact from the HGLA RFD and other nearby developments. Development consistent with the proposed action, in conjunction with other projects, would diminish habitat availability and quality, and potentially result in the "taking" of these species. Stipulations, permitting requirements, and agreements between the California Department of Fish and Game and the BLM, including compliance with Section 7 of the ESA, could minimize such impacts. However, other existing and proposed developments, such as solar energy projects, typically impact and alter thousands of acres and thus can have significant impacts to local populations of listed plant and wildlife species. The increase in the associated number of roads and transmission lines would result in additional losses from collisions.

Cultural Resources

As mentioned above, various renewable energy projects are being planned in and around the HGLA. Depending on whether these projects are on federal, state, or private land, they would be subject to either Section 106 of the NHPA or CEQA regulations. In accordance with either Section 106 or CEQA, project proponents would assess project-related effects on archaeological and historical resources. Table 4.20-1 summarizes the types of potential effects associated with different projects. In many cases, implementing BMPs and mitigation measures into the project's design can reduce or eliminate effects on significant cultural resources. However, cumulative impacts to cultural resources could still result from the gradual and incremental loss of cultural resources across the region.

Table 4.20-1 Types of Potential Effects on Cultural Resources

Project	Potential Visual Impact	Potential Ground Disturbance Impacts
Coso Geothermal Leasing Area	Height of facilities	Road grading, vegetation clearing, drilling, facility construction
Deep Rose Geothermal Exploration Project	Height of facilities	Road grading, vegetation clearing, drilling, facility construction
Debenham Energy Wind Energy Project	Height of wind turbine generators	Road grading, vegetation clearing, geotechnical drilling, turbine foundations
RES America Wind Energy Project	Height of wind turbine generators	Road grading, vegetation clearing, geotechnical drilling, turbine foundations
Haiwee Reservoir Seepage Recovery	Limited	Trenching for pipeline
Hay Ranch Water Extraction and Delivery System	Limited	Trenching for pipeline
North Haiwee Dam Replacement Project	Limited	Various construction activities
U.S. Highway 395 Improvement Projects	Limited	Road grading, vegetation clearing
Gill Station Road Improvements	Limited	Road grading, vegetation clearing
Teal/Cal Lightweight Pumice Mine	Height of facilities	Road grading, vegetation clearing, excavation

Paleontology

Federal land-holding agencies, such as the BLM, are in the process of developing regulations to implement the recently passed Paleontological Resource Protection Act (PRPA). In California, CEQA requires consideration of impacts to paleontological resources on state and private land. Paleontological resources are abundant in areas near the HGLA, so it is possible that past, present, and reasonably foreseeable future projects and actions in southern Inyo and northern Kern counties could impact these resources. However, the HGLA has a low potential for containing paleontological resources, and impacts from the proposed action are not likely. In this way, the proposed action or alternatives would not contribute to other projects' cumulative impacts on paleontological resources.

Visual Resources

Geothermal development in the HGLA, combined with other energy projects, could potentially alter the existing landscape in a number of ways, including negatively affecting sensitive viewers and the scenic quality of the landscape. Potential projects that may contribute to cumulative visual impacts include geothermal energy, solar energy, and wind energy developments as well as new roadway and transmission lines or upgrades.

Geothermal development in the HGLA and such other projects could increase the number of visible man-made structures in an area where such alterations to the landscape are generally absent, thus reducing the undeveloped nature of the landscape. They could also introduce elements such as night lighting and cooling tower plumes that would disrupt the existing visual environment.

Cumulative impacts to the scenic quality of the landscape could result from the combined visual contrast of multiple projects caused by visible structures, vegetation clearing, and ground disturbance impacting the existing landscape character and diminishing the overall aesthetic appeal of an area.

Impacts to sensitive viewers at viewpoints such as communities, recreation and preservation areas, travel corridors, and cultural sites could result when the visual contrast of multiple projects across the landscape is observed. The sensitive viewpoints identified in the HGLA and vicinity are typically stationary viewpoints where cumulative impacts would occur if the combined contrast of multiple projects across the landscape is observed in a single vista. However, cumulative impacts to sensitive viewers traveling along the U.S. Highway 395 corridor could also result if multiple projects were observed in succession along the corridor, substantially altering the viewer's visual experience.

Meteorological assessments for wind energy development are underway in southwestern Inyo County along U.S. Highway 395. Wind monitoring projects are speculative. However, if wind energy projects are constructed, the resulting turbines, transmission lines, vegetation clearing, and ground disturbance could contribute to cumulative visual impacts to sensitive viewers traveling along U.S. Highway 395. Cumulative visual impacts could also occur for Little Lake Overlook, Fossil Falls, and the Haiwee trailhead. Cumulative impacts could occur for additional sensitive viewers who may have more distant views of wind energy projects. However, these potential impacts are expected to be low.

Interest has been expressed in solar energy development at Hay Ranch, near Coso Junction along the highway. If a solar energy project is constructed, solar collection components, transmission lines, vegetation clearing, and ground disturbance could contribute to cumulative visual impacts to sensitive viewers traveling along U.S. Highway 395 and to the community of Coso Junction. Cumulative impacts could occur for additional sensitive viewers who may have more distant views of solar energy projects. However, these potential impacts are expected to be low.

The existing Coso Geothermal complex's cooling tower plume, along with other energy projects' cooling tower plumes, may contribute to cumulative visual impacts to sensitive viewers. Viewers in nearby communities along U.S. Highway 395, and in recreation and preservation areas could have views of cooling tower vapor plumes, depending on the location of the facility and atmospheric conditions. Typically, the closer facilities are located to sensitive viewpoints, the greater the dominance of the vapor plume in the visual setting, and the greater the potential impacts that may result.

Agency management objectives may not be met due to the cumulative impacts of multiple projects. The cumulative impacts of the proposed action and other planned or potential projects are not likely to meet the VRI/VRM Class II objective, which seeks to retain the existing character of the landscape. Similarly, the cumulative impacts may not meet the VRI/VRM Class III objective, which seeks to partially retain the existing character of the landscape. However, implementing the BMPs described in Chapter 2 and Appendix A would likely reduce the cumulative impacts to a level that would meet the VRI/VRM Class III objective.

To meet the VRI/VRM Class III objective, mitigation measures may include locating facilities and related disturbance so as not to dominate the landscape, and at the maximum distance from sensitive viewpoints. Additional measures to minimize cumulative impacts would include co-locating pipelines and transmission lines, particularly with existing linear facilities.

Lands and Realty

Cumulative impacts from management of lands and realty are limited to direct on-the-ground impacts to other resources such as visual quality, water quality, and biological resources. Therefore, leasing of geothermal resources in the HGLA would not have a cumulative impact on the HGLA's land and realty resources.

Public Health and Safety

Regardless of which project or action is implemented, if project proponents follow all applicable health and safety regulations, cumulative impacts to public health and safety are expected to be negligible. Though there is a potential for hazardous spills, BMPs would contain the spills, which would not be large enough to combine with spills at other project sites. The potential for cumulative impacts from the hazardous or solid wastes produced by Alternatives A, C, and D would be minimal.

Mineral Resources

Currently, pumice is the primary economically viable mineral resource in the area. Cumulative impacts to this mineral would occur if developmental impacts associated with the proposed action are combined with impacts of other renewable energy projects. Though it is unlikely that all of the proposed/potential renewable energy projects in the region would be constructed, it is reasonable to assume that some of the projects would be constructed. Should the BLM lease land for geothermal energy project development, it might limit future mineral development in the HGLA. Other activities proposed in the area might also limit certain mineral development opportunities. However, because pumice exists throughout the region, the cumulative impact to this mineral resource is expected to be minimal, regardless of whether the proposed action, alternatives, or the other projects and actions mentioned above are implemented.

Wild Horses and Burros

Based on the level of occurrence of wild horses and burros in the HGLA, and availability of appropriate stipulations and BMPs, any cumulative impacts to wild horses and burros from geothermal leasing and other future developments would be expected to be negligible.

Grazing

The cumulative impact to grazing allotments depends on the location(s), size(s), and type(s) of renewable energy project(s) that might be constructed. In implementing the proposed action or alternatives, the amount of land that might be leased is small compared to the amount allotted for grazing. In this way, the acreage available for grazing and the number of livestock are not expected to be reduced significantly. Should additional geothermal projects be constructed in the region, the cumulative impact could create conditions whereby ranchers no longer view grazing as an economically viable operation. Ranchers might then retire grazing agreements and relocate operations to another area. However, royalties that leaseholders pay to ranchers may lessen the economic burden of relocating grazing operations.

Concerning solar and wind energy projects, it is unlikely that proponents would construct all of the projects mentioned above. However, it is important to note that the amount of land required for these projects would be 12 times greater than the amount forecast in the HGLA RFD scenario. Should only the Beacon and Ridgecrest solar projects along with Debenham Energy's and RES America Development's wind projects be constructed, in total, these projects would require 78 percent more land than the HGLA RFD scenario. Whether these solar and wind projects are constructed alone, or in addition to the proposed action or alternatives, they would be expected to create greater economic losses for ranchers than geothermal projects alone.

Recreation

The cumulative impact of implementing the proposed action, alternatives, or any of the other projects and actions mentioned above, would be expected to diminish the public's access to passive and active recreation in and around the HGLA. More specifically, most of the indirect impacts to recreation from the proposed action and Alternatives C and D concern possibly limiting access, disturbing wildlife, and reducing recreational enjoyment. Wildlife gathering areas would be subject to these impacts, which might reduce the public's ability to enjoy these areas for photographing nature and viewing wildlife.

In California, OHV popularity continues to increase, while legal opportunities for OHV recreation continue to decrease. As the pressure to develop land increases, the amount of land available for OHV use is expected to decrease. Implementing any of the projects and actions mentioned above, alone or in combination with other land development activities, might compel OHV enthusiasts to seek out new places to recreate. In this way, such a shift could overcrowd other existing recreation areas, adversely impact previously undisturbed areas that might include sensitive plant and wildlife habitat, and/or lead OHV enthusiasts to use undeveloped, vacant land illegally. New routes created by geothermal projects might create new might require a CDCA plan amendment for route designation. Also, BLM law enforcement may need to focus more staff in patrolling the HGLA so that the safety of recreation visitors and the geothermal infrastructure is secured and so that the natural resources are not further impacted by unauthorized travel off designated BLM trails. However, implementing appropriate mitigation measures would be expected to reduce cumulative impacts to passive and active recreation resources.

Special Designations

Local government officials in Inyo and Kern counties would be expected to minimize cumulative impacts to special designated areas in their jurisdictions. More specifically, local government officials would require any project proponent to comply with the terms and conditions of all applicable local land development regulations, permits, and development agreements, and respect site-specific management policies. In this way, the cumulative impacts to special designated areas would be expected to be minimal.

Traffic/Transportation

With regard to impacts to the existing traffic and transportation systems it is important to identify past, present, and reasonably foreseeable future projects and actions that, when added to the projected impacts from geothermal development in the HGLA above, could provide additional impacts to the transportation network and traffic flows in and around the HGLA. However, such actions, as presented below, would not be expected to degrade the levels of service to below acceptable levels along the roadways of southwestern Inyo County and northeastern Kern County. More specifically, further development in the Coso geothermal development area and the Deep Rose geothermal exploration area would introduce construction vehicles and personal vehicles to U.S. Highway 395 in the vicinity of the HGLA. Yet, according to Inyo County's 2009 Regional Transportation Plan, the county has programmed funding to reconstruct Gill Station-Coso Road. Reconstructing this road would help mitigate impacts associated with an increase in construction and personal vehicle traffic en route to and from the Coso geothermal area.

In addition, the California Department of Transportation plans to widen U.S. Highway 395 to a four-lane facility in Independence, and between Olancha and Cartago (Inyo County 2009). Such a project would help mitigate the increase in construction vehicle and personal vehicle traffic associated with developing the RFD scenario in the HGLA.

Finally, one of Kern County's goals is to develop additional access points to the NAWS, if deemed necessary by Navy officials (Kern County 2007). Providing more access to this naval facility could help reduce the amount of traffic along U.S. Highway 395.

Socioeconomics

Cumulative socioeconomic impacts could occur if multiple projects increase populations, which could impact housing, public services, local public finances, or low-income and minority populations. The following analysis describes cumulative impacts that might occur should the HGLA RFD scenario be combined with other renewable energy projects and non-energy-related construction projects.

<u>HGLA RFD Scenario</u>

The RFD scenario's socioeconomic impacts would be minimal. However, more significant impacts might occur if multiple projects are constructed during the same time period and/or in the vicinity of the HGLA. In 2016, when geothermal plant construction is scheduled to begin, competition for relevant construction skills could arise if other heavy construction projects of significant size are in progress. If the local work force is fully utilized, construction managers for on-site projects, as well as for other projects in the region, would have to attract workers from outside the area. In this way, the demand for transient housing and public services might increase, along with a potential long-term population increase.

<u>Additional Renewable Energy Projects</u>

During the next several years, it is expected that wind and solar generation projects, and their associated transmission lines, would be needed to serve Southern California markets. The number and size of such projects indicates considerable interest in the region's value as a location for renewable electricity generation and distribution. Though there are no construction schedules for such wind and solar projects, their construction activities would likely occur beyond 2015 and possibly coincide with the RFD's 2016-2020 development period.

Another significant potential for energy development would be continuing solar energy generation and distribution from the Tehachapi Wind Resource Area (TWRA). The TWRA currently consists of about 3,400 wind turbines producing about 710 MW of power. There is interest in increasing TWRA's generating capacity and at the nearby Alta development, which could add 700-900 MW of capacity. No applications have been filed for additional wind projects, and there is no specific information to conduct a full environmental evaluation (Kern County 2009). Implementing these projects would greatly increase Inyo and Kern counties' populations, demands for housing and public services, personal incomes, and tax revenues. Individual or cumulative employment estimates for these projects are not available.

Concerning the four projects that the CEC is reviewing, from 2011-2013, their average daily employment is expected to be 2,272. Should the four projects and all of the other proposed projects named above be constructed, their direct and indirect impacts would be substantial and spread throughout northern Los Angeles, Kern, and northwest San Bernardino counties. Though it is unlikely that all of the proposed/potential renewable energy projects in the region would be constructed, it is reasonable to assume that some would be constructed. In this way, the region might rebound from employment losses that it suffered during the 2007-2009 recession. However, it is important to note that renewable energy project development is speculative and long-term operation would require small work forces.

Non-Energy-Related Construction Projects

In addition to projects proposed in the HGLA's vicinity, other construction projects were assessed based on their potential to impact housing and public services that are not available in the HGLA's vicinity. Numerous residential, commercial, and small industrial projects have been identified in reports citing development applications in the cities of the SSA. These projects are considered part of "normal," baseline development, rather than major projects that would change the population and employment projections for the region.

Projects of interest to this cumulative impacts analysis would be those with significant construction activity planned when geothermal plant construction and well drilling on-site would be occurring from 2016 to 2020. Because of the long lead time needed for exploration and environmental permitting before construction could begin on-site, most construction projects specifically identifiable for the region would already be completed before the critical 2016-2020 time period. Projects that could have significant construction labor demands, and associated population, housing, and public services/finances impacts, are in early planning stages. Reliable estimates of their construction employment demands, or actual schedules, are unknown.

During 2016-2020, the California High Speed Rail Project is the only major project with information that can be used to evaluate cumulative impacts. The project's 60-minute commuting radius for construction workers would overlap the SSA. This project would link the San Francisco Area and the Los Angeles/San Diego area with high-speed rail. The rail line would pass through Bakersfield in Kern County and Palmdale in Los Angeles County. From 2013 to 2017, proponents would construct the Bakersfield-Palmdale and Palmdale-Los

Angeles links. During this time period, the project is expected to employ approximately 160,000 construction workers. Peak construction would occur in 2015. The rail line would be commissioned in 2018.

No annual work force estimates have been published for the Kern County portion of the project alone. However, based on construction cost estimates published by the California High-Speed Rail Authority (CHSR 2009) for the two links passing through Kern County, the annual construction work force could be approximately 3,000 workers in 2013-2017, with peak-year employment of approximately 4,000. The size of this construction project could have significant impacts on the demand for Kern County construction workers, as well as on Kern County's population, particularly in the SSA's southern portion.

As mentioned above, the RFD scenario's impacts are expected to be minimal. However, if considered along with the other potential energy projects and the California High Speed Rail Project, there would likely be a need for temporary workers beyond those that are locally available. This may cumulatively result in significant, temporary impacts on local populations, housing, and public services; and temporary cumulative impacts to the region.

4.21 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires an analysis of significant irreversible or irretrievable commitment of resources. Resources irreversibly or irretrievably committed are those utilized on a long-term or permanent basis, or consumed through implementation of the action.

Any decision to amend the CDCA Plan (or not) would not result in an irreversible or irretrievable commitment of resources because the plan amendment does not authorize the development of any geothermal resources or any specific geothermal project. It is possible that the HGLA RFD will not be implemented, even if the CDCA Plan is amended to allow for geothermal development within the HGLA. Neither would issuance of the three pending lease applications result in an irreversible or irretrievable commitment of resources, as the applicants would not be allowed to develop the resource without further approval of the BLM undertaken in compliance with applicable Federal laws, including NEPA. Any irreversible or irretrievable commitment of resources within the HGLA will not occur unless and until the BLM authorizes the development of specific geothermal resources at a later time through a separate decision.

4.22 SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY OF THE ENVIRONMENT

The relationship between the anticipated short-term use of environmental, land use, and socioeconomic resources, and the maintenance and enhancement of long-term productivity, typically considers short-term construction impacts versus the long-term benefits of the project. If geothermal leases are issued, short-term impacts are typically associated with the exploration, construction, and maintenance phases, and include activities such as access road construction, increased traffic volumes and human disturbance, well construction and development, and construction and testing of the geothermal power plant facilities and associated infrastructure. Long-term impacts are typically associated with operation of these facilities during their projected life. These impacts were found to include the long-term loss of vegetation and displacement of wildlife from developed areas; minor adverse air quality impacts from plant facilities and vehicles; negligible noise impacts from plant facilities such as cooling towers and steam vents; visual impacts; generation of wastes; and possible conflicts with recreational use, livestock grazing, mineral extraction, and access to public lands.

The extent of both short- and long-term impacts will be dependent, to a large degree, on the site-specific conditions at future geothermal development sites. Future NEPA studies and permitting efforts will identify the suitability of candidate locations. Potentially adverse impacts will be mitigated, to the greatest degree feasible, by the various BMPs, stipulations, and lease terms described in Chapter 2. Moreover, the generation of jobs and other economic benefits, along with the generation of clean, renewable energy production, will clearly provide long-term benefits to Inyo County and surrounding areas under this program. As stated in BLM's Programmatic Environmental Impact Statement for Geothermal Leasing in the Western United States (BLM, 2008):

> *"Over the long-term, while geothermal plants are in production, these new plants would be producing a low-cost, clean source of renewable energy for use in the project area and other western states. While in production, each plant would provide employment opportunities for citizens of surrounding communities. The sale of this new energy would be a new source of revenue for the counties within which the projects are located. In addition, geothermal energy development offsets the use of irretrievable resources such as coal and oil, which would result in less pollution, fewer greenhouse gas emissions, less dependence on foreign oil and gas, and a possible reduction in the trade deficit."*

4.23 RESIDUAL IMPACTS

Under the BLM's three action alternatives opening the HGLA to geothermal leasing and amending the CDCA Plan to reflect that decision, any future geothermal exploration, development, and utilization in the HGLA would result in a number of short- and long-term residual impacts as discussed throughout previous sections of Chapter 4. Residual impacts are those impacts that would remain after mitigation measures have been applied. If geothermal leases were developed and issued following thorough NEPA analyses, evaluation of alternatives, and meeting the appropriate permitting requirements, the following general residual impacts could be expected under BLM's Haiwee RFD scenario:

- Long-term loss of vegetation, wildlife habitat, and soils within 276 acres of HGLA lands and in the short-term construction footprint, in the absence of vegetation restoration;
- Short-term and intermittent noise impacts from exploration, construction, and maintenance activities. Noise impacts during the subsequent operation of the geothermal power plants should be minimal, although somewhat dependent on cooling tower technology;
- Possible loss of some recreational opportunities due to access restrictions into developed areas;
- Long-term visual impacts from the geothermal power plants and associated facilities like roads and transmission lines;
- Potentially short-term and local impacts to groundwater;
- Short-term and local impacts to traffic volumes and the transportation network during construction;
- Short-term seasonal impacts to housing during the peak of construction.

4.24 PLAN CONFORMANCE

The land use plan amendment decision to be made by the BLM is a site identification decision only. The HGLA is located within land that is managed as Multiple Use Class L. The classification designations govern the type and degree of land-use action allowed within the classification area. Land use actions and resource-management activities on public lands within a multiple-use class delineation should meet the guidelines for that class. Multiple use class L allows the development of geothermal power plants under the electric generation facilities subpart pursuant to licenses being issued under 43 CFR Section 3250, et. seq. This allowance also requires an EIS. These guidelines are listed on Table 1, Multiple Use Class Guidelines, to the CDCA Plan of 1980 (at page 15). The specific application of the multiple use class designations and resource management guidelines for a specific resource or activity are further discussed in the plan elements section of the CDCA Plan. Class L lands are managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that the sensitive values are not significantly diminished. Approximately fifty percent of the California Desert Conservation Area is managed as Class L land.

The HGLA site location for the project meets the Multiple Use Class Guidelines (as applicable to the particular project/alternatives/site locations) as noted in the CDCA Plan for the following reasons:

1. <u>Agriculture:</u>
   Agricultural uses, excluding livestock grazing, are not allowed on Class L lands. The site is not currently used for agriculture, and none of the project alternatives would involve use of the site for agriculture. Therefore, all five alternatives would be in conformance with this guideline.

2. <u>Air Quality:</u>
   Class L lands, including the proposed site location and the alternatives, are to be managed to protect their air quality and visibility in accordance with Class II objectives of the Federal 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. These Class II objectives include, among others, attainment and maintenance of the ambient air quality standards and protection of visibility within the CDCA. The air emissions that would be associated with the proposed project are discussed in Section 4.2. These values have been compared to emissions objectives for air quality and visibility associated with Class II areas, and are all well below the limitations required for Class II areas. The emissions associated with Alternatives A, C and D would be similar, and there would be no emissions associated with Alternatives B and E. Therefore, all of the alternatives would conform to the Class II objectives referenced in the CDCA Plan guidelines.

3. <u>Water Quality:</u>

Class L land will be managed to minimize the degradation of the water resources. Best management practices, developed by the BLM during the planning process outlined in the Clean Water Act, Section 208, et seq., will be used to avoid degradation and to comply with Executive Order 12088. Section 4.6 of this EIS evaluated the Alternatives for groundwater use conflicts, the potential to impact groundwater quantity and quality, and the potential to impact surface water resources. As analyzed in Chapter 4.6, Alternatives A, C and D, could utilize groundwater but would not result in degradation due to the requirements built in to the alternatives. Without the exact siting of a geothermal project, it is difficult to project exact impacts to surface water. However, with the conditions built into the action alternatives, there would be no degradation of the surface water. Alternatives B and E would not impact groundwater or surface water. BLM's standard terms and conditions requiring compliance with other Federal, state, and local regulations would result in compliance with Executive Order 12088. The measures would be applicable to all project alternatives, and would therefore conform to the guidelines in Table 1 of the CDCA Plan.

4. <u>Cultural and Paleontological Resources:</u>
   Archaeological and paleontological values will be preserved and protected. Procedures described in 36 CFR 800 will be observed where applicable. Sections 4.8 and 4.9 describe the impacts on cultural and paleontological resources associated with the project. All five alternatives would conform to the guidelines. All of the alternatives are within the MUC Guidelines for cultural and paleontological resource protection established by the CDCA Plan.

5. <u>Electrical Generation Facilities:</u>
   Geothermal generation may be allowed pursuant to licenses issued under 43 C.F.R. Section 3250, et. seq. and after NEPA requirements are met. The analysis contained in the EIS, comprise the NEPA compliance required for this MUC guideline. All action alternatives would require licenses consistent with 43 C.F.R. 3250, et. seq. All alternatives are in conformance with the CDCA Plan for generation facilities.

6. <u>Transmission Facilities:</u>
   Class L guidelines allow electric transmission to occur in designated ROW corridors. The HGLA is partially located in a corridor. A transmission line for each power generation facility is part of the three action alternatives. If this transmission line is of 161 kV or above and is outside of the designated corridor a Plan Amendment would be required. If the transmission lines are within the designated corridor, all the action alternatives are in conformance with the CDCA Plan requirements for Class L

transmission facilities. Alternatives B and E are in conformance with the CDCA Plan since they do not include any new transmission lines.

7. Communication Sites:
None of the alternatives would require the installation of communications sites.

8. Fire Management:
Fire suppression measures in Class L areas will be taken in accordance with specific fire management plans, subject to such conditions as the authorized officer deems necessary. The project area is within the area covered by the California Desert District Fire Management Plan, March 2010. That Plan addresses management and suppression of wildfires, and does not address incidents on specific facilities such as power plants. Should a fire occur in the area that is not specific to the facility, it would be addressed by BLM, not by the applicant, and it would be addressed in conformance with the Fire Management Plan.

9. Vegetation:
Table 1 of the CDCA Plan includes a variety of guidelines associated with vegetation. These are addressed in the EIS as follows:

Native Plants
Removal of native plants in Class L areas is only allowed by permit after NEPA requirements are met, and after development of necessary stipulations. Approval of the ROW grant for the any of the action alternatives would constitute the permit for such removal. The mitigation measures in the EIS and conditions of approval to be required in the Record of Decision would constitute the stipulations to avoid or minimize impacts from the removal.

Harvesting of plants by mechanical means
Harvesting by mechanical means is also allowed by permit only. The guidelines for vegetation harvesting include encouragement of such harvesting in areas where the vegetation would be destroyed by other actions, which would be the case with the action alternatives. Therefore, the proposed project and its alternatives would be in conformance with this MUC guideline.

Rare, Threatened, and Endangered Species, State and Federal
In all MUC areas, all state and federally listed species will be fully protected. In addition, actions which may jeopardize the continued existence of federally listed species will require consultation with the U.S. Fish and Wildlife Service. This is fully evaluated in Section 4.7.

Sensitive Plant Species

Identified sensitive plant species would be given protection in management decisions consistent with BLM's policy for sensitive species management, BLM Manual 6840. The objective of this policy is to conserve and/or recover listed species, and to initiate conservation measures to reduce or eliminate threats to BLM sensitive species to minimize the likelihood of and need for listing. Further information on sensitive plant species may be found in Section 4.7, including mitigation measures to reduce the potential impact of the action alternatives. Because these measures are intended to reduce threats to this species to minimize the likelihood of listing, these measures are in conformance with the MUC guidance in the CDCA Plan.

Unusual Plant Assemblages (UPAs)

No UPAs have been identified on the site of the proposed HGLA.

Vegetation Manipulation

Manipulation of vegetation in Class L areas by mechanical control or aerial broadcasting is not permitted. Vegetation manipulation is defined in the CDCA Plan as removing noxious or poisonous plants from rangelands; increasing forage production; creating open areas within dense brush communities to favor certain wildlife species; or eliminating introduced plant species. None of these actions would be conducted as part of the action alternatives. Noxious weed eradiation is allowed after site-specific planning. Types and uses of pesticides, in particular herbicides, must conform to Federal, States and local regulations. The action alternatives would require the applicant follow required regulations. Therefore, each alternative would conform to the guidelines.

10. <u>Land Tenure Adjustment:</u>
The CDCA Plan states that Class L land would not be sold. None of the alternatives would involve the change of ownership of land.

11. <u>Livestock Grazing:</u>
Class L lands are managed to allow grazing and support facilities with the protection of sensitive resources. Manipulation of vegetation by chemical or mechanical means is not allowed except for site-specific needs. No alternatives involve the addition of livestock or livestock support facilities. However, depending upon the potential future siting of a geothermal facility, the animal management units in an existing grazing allotment may be reduced. No alternative involves changing the allowance of grazing, installation of support facilities or the manipulation of vegetation. All alternatives are in conformance with the plan.

12. Minerals:
    No alternatives involve the development of non-fluid minerals on Class L lands.

13. Motorized Vehicle Access/Transportation:
    Pursuant to the CDCA LUP guidelines in Class L areas, new roads may be developed under ROW grants or pursuant to regulations or approved plans of operations. In areas designated as limited use area for OHV use, such as the site locations under consideration in this FEIS, changes to the transportation network (new routes, re-routes, or closures) in "limited" areas may be made through activity-level planning or with site-specific NEPA analysis (IM 2008-014). Some roads would be developed if Alternatives A, C or D are selected. The specific roads would require a later site-specific NEPA analysis. The access needs for the two geothermal facilities do not substantially differ among the various alternatives presented in the EIS. The alternatives are compliant with the CDCA LUP guideline.

14. Recreation:
    The action alternative would not involve the use of the proposed project for recreational uses.

15. Waste Disposal:
    No alternatives would involve the development of waste disposal sites.

16. Wildlife Species and Habitat:
    Table 1 of the CDCA Plan includes a variety of guidelines associated with wildlife. These are addressed in the EIS as follows:

    Rare, Threatened, and Endangered Species, State and Federal
    In all MUC areas, all state and federally listed species and their critical habitat will be fully protected. In addition, actions which may jeopardize the continued existence of federally listed species will require consultation with the U.S. Fish and Wildlife Service. As discussed in Section 4.7, the desert tortoise, which is listed as federally and state threatened, would be affected by the action alternatives. However, the action alternatives would cause only minor affects to critical habitat. The BLM has initiated formal consultation with the U.S. Fish and Wildlife Service in accordance with Section 7 of the Endangered Species Act. Section 4.7 identifies protection and compensation measures for the desert tortoise, which include stringent avoidance measures, the full level of compensation required by USFWS for this category of tortoise habitat, and enhancement and protection measures in other areas. Therefore, the proposed project and its alternatives would comply with the guideline to provide full protection to the species.

Sensitive Species
Identified species would be given protection in management decisions consistent with BLM's policy for sensitive species management, BLM Manual 6840. The objective of this policy is to conserve and/or recover listed species, and to initiate conservation measures to reduce or eliminate threats to BLM sensitive species to minimize the likelihood of and need for listing. BLM sensitive wildlife species are discussed in Section 3.7 and the effects of the Alternatives is analyzed in Section 4.7.

The action alternatives including the mitigation measures associated with these actions, could involve habitat manipulation to improve habitat (such as restoration work). Habitat manipulation to improve wildlife habitat is allowed in Class L subject to environmental assessment, which will be completed separately. Therefore, the alternatives would be in conformance with these guidelines.

Although allowed by the CDCA Plan, the action alternatives do not involve the introduction or reintroduction of any species, so all alternatives are in conformance with this part of the plan.

17. Wetland/Riparian Areas:
Wetland/riparian areas will be considered in all proposed land use actions. These issues were considered in the analysis of the HGLA for the all alternatives. All alternatives are in compliance with this part of the Plan.

18. Wild Horses and Burros:
Under the CDCA Plan guidelines, populations of wild and free-roaming horses and burros will be maintained in healthy, stable herds, but will be subject to controls to protect sensitive resources. No alternative changes this Plan element.

19. Corridor Analysis:
The HGLA contains two utility corridors. Depending on the actual location of a geothermal facility, which would be determined in a future NEPA decision, the development could impact the use of the corridor for future transmission needs. There appears to be adequate capacity within the corridors for some use of the corridors for geothermal development. In the actual siting of a facility, it will be important to conduct a detailed corridor analysis to determine the impact to the corridor for the specific project. All alternative should allow the continued function of the corridor to meet future needs.

THIS PAGE INTENTIONALLY LEFT BLANK.

CHAPTER 5

CONSULTATION

COORDINATION

AND

PUBLIC PARTICIPATION

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

TABLES:

CHAPTER 5 CONSULTATION, COORDINATION AND PUBLIC PARTICIPATION

5.1 INTRODUCTION

Federal agencies preparing an Environmental Impact Statement (EIS) must "make diligent efforts to involve the public in preparing and implementing their National Environmental Policy Act (NEPA) procedures" (40 CFR 1506.6 (a)). Early and continuing coordination with the public and agencies are an essential part of the environmental review process to determine the scope of environmental documentation, the level of analysis, potential impacts and mitigation measures, and related environmental requirements. Council of Environmental Quality (CEQ) regulations provide guidance on the scoping process, including inviting participation of affected federal, state, and local agencies, Indian Tribes, as well as any other interested parties (40 CFR 15017.7 (a)(1)).

Consistent with the NEPA procedures, public participation and agency consultation have been accomplished through issuance of public notices, public scoping meetings, and correspondence with agencies and Native American Tribes. This chapter summarizes the results of the Bureau of Land Management's (BLM) public involvement efforts to fully identify, address, and resolve program-related issues through early and continuing coordination.

5.2 SCOPING

Scoping is an "early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action" (40 CFR 1501.7). The public, affected agencies, Native American Tribes, and other interested parties are invited to participate in the environmental review process. In addition to the purpose of informing the public about the HGLA, the scoping process is also meant to achieve the following: (1) identify potentially significant environmental impacts for consideration in the EIS; (2) identify possible mitigation measures; (3) identify alternatives to the proposal; and (4) compile a notification list of public agencies and individuals interested in future meetings and notices.

5.2.1 Public Scoping Meeting

The BLM conducted four public scoping meetings between October 13 and October 20, 2009, in Lone Pine, Bishop, Ridgecrest and Death Valley, California. These meetings were attended by a total of 32 attendees. Table 5.2-1 lists the dates, and locations for each of the meetings. The scoping meetings provided an opportunity for the BLM to: (1) share information regarding the HGLA; (2) discuss the proposed CDCA Plan Amendment, the decision-making processes regarding amending a plan, and consideration of whether to grant or deny pending geothermal leases; and (3) listen to the public, agency, and Native American views on the range of issues and alternatives to be considered during the preparation of the EIS and proposed CDCA Plan Amendment.

Table 5.2-1 Scoping Dates and Locations

Date	Location
Tuesday, October 13, 2009 5:30 – 9:00 p.m.	Boulder Creek RV Resort 2550 S. Hwy 395 Lone Pine, CA
Wednesday, October 14, 2009 5:30 - 9:30 p.m.	Eastern Sierra Fairgrounds Home Economics Bldg. Sierra Street & Fair Drive Bishop, CA
Thursday, October 15, 2009 5:30 - 9 p.m.	Kerr-McGee Center 100 W. California Ave Ridgecrest, CA
Tuesday, October 20, 2009 10:00 a.m. to 1:30 p.m.	Timbisha Shoshone Tribal Office 900 Indian Village Rd Death Valley, CA

5.3 CONSULTATION AND COORDINATION

This section describes the consultation and coordination efforts conducted by the BLM with the public, agencies, and elected officials in the preparation of this Draft EIS, the proposed CDCA Plan Amendment, and decision-making regarding issuance of any of the pending lease applications. To engage the public and agencies in the NEPA process, the BLM published a Notice of Intent, distributed two press releases, held field tours, provided briefings, and responded to all communication opportunities.

5.3.1 Notice of Intent

To comply with 40 CFR 1508.22, on September 11, 2009, the BLM published a Notice of Intent (NOI) in the *Federal Register*, Volume 74, Number 175. Entitled "*Notice of Intent To Prepare an Environmental Impact Statement for the Proposed Leasing of National System of Public Lands for Geothermal Resource Development in the Haiwee Geothermal Leasing Area Located in Inyo County, CA and To Amend the California Desert Conservation Area Plan of 1980*", the NOI described the BLM Ridgecrest Field Office's intent to prepare an EIS to analyze the proposed leasing of 22,460 acres of BLM-managed public lands for geothermal exploration, development, and utilization in the Haiwee Geothermal Leasing Area (HGLA).

The September 11, 2009, NOI also served to announce that the leasing of public lands will require an amendment to the California Desert Conservation Area (CDCA) Plan of 1980, as amended. As such, the BLM also complied with the requirements of 43 CFR 1610.2(c) requiring notification of the public on potential amendments to land use plans.

The NOI initiated the public scoping period for the Haiwee EIS and proposed CDCA Plan Amendment. The NOI provided the background and need for the proposed action, and described the locations of public lands being considered for geothermal leasing in the HGLA. It discussed the alternatives identified for evaluation in the EIS, aspects of the environmental review process, as well as the preliminary issues to be addressed in the EIS. The NOI provided the BLM contact information, and served as an invitation for other federal agencies to provide comments on the scope and content of the EIS/Plan Amendment, and requested that all comments be received by October 13, 2009.

5.3.2 News Releases

On September 11, 2009, the BLM issued a news release announcing the times and locations of the public scoping meetings in Lone Pine, Bishop and Ridgecrest, California. The news release also listed issues to be analyzed in the EIS, and contact information. A second news release was issued on October 10, 2009, announcing the addition of the Death Valley scoping meeting date, time, and location.

On July 28, 2011, the BLM issued a news release announcing that decisions will be made regarding the authorization or denial of the three pending lease applications. This analysis and decision making process is consistent with the presentation at each of the Scoping Meetings.

5.3.3 Agencies

Federal, state, and local agencies were invited to participate in the HGLA scoping meetings via two news releases issued by the BLM. The news releases also identified preliminary issues and concerns for the project, as well as contact information. Follow up emails, letters, and telephone calls were made to the agencies to solicit issues and concerns, and coordinate with permitting agencies.

5.3.4 Elected Officials

Inyo County Supervisors were sent scoping letters inviting them to participate in the scoping process for the BLM's preparation of an EIS and proposed CDCA Plan amendment for geothermal exploration, development, and utilization in the HGLA. The letters also described the proposed action, NEPA process, scoping, preliminary resource management issues and concerns, and schedule. A representative copy of the letter may be found in Appendix H, and Table 5.3-1 lists the recipients and their districts.

Table 5.3-1 Inyo County Supervisors and Representative Districts

Inyo County Board of Supervisors	Representative District
Linda Arcularius	District 1
Susan Cash	District 2
Beverly Brown (now Rick Pucci)	District 3
Marty Fortney	District 4
Richard Cervantes	District 5

5.3.5 Naval Air Weapons Station, China Lake

On September 24, 2010, the BLM conducted a briefing with the Naval Air Weapons Station (NAWS), China Lake. The BLM took this opportunity to inform NAWS about the HGLA; to go over the purpose and need for geothermal leasing on BLM-managed lands; to review the alternatives; as well as to solicit comments.

5.3.6 California Office of Historic Preservation

The BLM Ridgecrest office consulted with the California Office of Historic Preservation in Sacramento in regard to the nature of the project and Section 106 compliance.

On May 23, 2011, the BLM Project Manager and the Ridgecrest Field Office Manager met with members of the State Historical Preservation Office (SHPO) in a teleconference. This meeting provided SHPO a general briefing and overview of the project.

On August 31, 2011 and September 1, 2011, the BLM Project Manager and Ridgecrest Field Office staff met with members of the SHPO and provided an in-depth project review and site tour.

5.3.7 Government-to-Government Consultation with Indian Tribes

5.3.7.1 *Laws, Regulations, and Policies*

There are numerous federal laws, regulations, and policies directing agencies to consult with federally recognized Indian tribes in a government-to-government manner. Information and guidelines can be found in BLM Handbook H-8120-1.

National Environmental Policy Act (NEPA) Implementing Regulations 40 CFR Part 1500

NEPA requires the preparation of an environmental assessment (EA) or environmental impact statement (EIS) for any proposed major federal action that may significantly affect the quality of the human environment. While the statutory language of NEPA does not mention Indian tribes, the Council on Environmental Quality (CEQ) regulations and guidance do require agencies to contact Indian tribes and provide them with opportunities to participate at various stages in the preparation of an EA or EIS. CEQ has issued a Memorandum for Tribal Leaders encouraging tribes to participate as cooperating agencies with federal agencies in NEPA reviews. Section 40 CFR 1501.2(d)(2) requires that Federal agencies consult with Indian tribes early in the NEPA process. Other sections also refer to interacting with Indian tribes while implementing the NEPA process.

National Historic Preservation Act (NHPA), as amended (16 USC 470f)

The principal federal law in the United States protecting historic properties. Historic properties are those properties that are eligible for, or listed on the National Register of Historic Places. In carrying out its responsibilities under Section 106 of this Act, a federal agency shall consult with any Indian tribe that attaches religious and cultural significance to historic properties. Section 304 of the NHPA also provides for maintaining the confidentially of information concerning the nature and location of historic properties to protect resources in specific circumstances. The ACHP has promulgated regulations implementing section 106 of the NHPA at 36 CFR Part 800.

The Archeological Resources Protection Act of 1979. (ARPA) (16 U.S.C. 470aa-mm)

Directs federal agencies to consult with tribal authorities before permitting archeological excavations on tribal lands (16 U.S.C. 470cc(c)). Consultation is specifically required where issuance of a permit for the excavation of an archaeological resource poses a threat to sites of religious or cultural importance. It also provides for the confidentially of information concerning the nature and location of archeological resources, including tribal archeological resources.

NAGPRA (25 U.S.C. 3001, et. seq.)
Requires consultation with Indian tribes, traditional religious leaders and lineal descendants of Native Americans regarding the treatment and disposition of specific kinds of human remains, funerary objects, sacred objects and other items.

American Indian Religious Freedom Act of 1978 (AIRFA) (Title 42, U.S. Code, Section 1996)
Establishes policy of respect and protection of Native American religious practices. It seeks to correct federal policies and practices that could (a) deny access to sacred sites required in traditional religions, (b) prohibit use and possession of sacred objects necessary for religious ceremonies, and (c) intrude upon or interfere with religious ceremonies. The BLM complies with AIRFA by obtaining and considering the views of traditional religious practitioners as part of the NEPA compliance process.

Executive Memorandum of April 29, 1994 (Presidential Memorandum for the Heads of Executive Departments and Agencies Regarding Government-to-Government Relations with Native American Tribal Governments)
Directs each federal agency to operate within a government-to-government relationship with federally recognized tribal governments; consult with tribal governments; assess the impact of plans, projects, programs, and activities on tribal trust resources; and assure that tribal rights are taken into account during consideration of such plans, projects and activities.

Executive Order. 13175 (Consultation and Coordination with Indian Tribal Governments), issued November 6, 2000
Directs federal agencies to establish regular and meaningful consultation and collaboration with Tribal officials in the development of federal policies that have Tribal implications, to strengthen the United States government-to-government relationships with Indian tribes as described in the Executive Memorandum of April 29, 1994, and to reduce the imposition of unfunded mandates upon Indian tribes.

Executive Order 13007
Directs federal agencies to accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners. It requires federal agencies to avoid adversely affecting the physical integrity of sacred sites to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions. EO 13007 reinforces the purposes expressed in

AIRFA. The BLM complies with EO 13007 by consulting with tribal governments and Indian religious practitioners as part of the NEPA compliance process.

DOI Consultation Policy
In December 2011, the Department of the Interior issued the *Policy on Consultation with Indian Tribes*. This policy clarifies and provides guidance into the application of various laws and regulations that pertain to tribal consultation. BLM guidance for tribal consultation is also provided in *Manual 8120 Tribal Consultation under Cultural Resource Authorities* (2004) (http://www.blm.gov/style/medialib/blm/ wo/Information_ Resources_Management/policy/blm_manual.Par.80216.File.dat/8120.pdf); and in *Handbook H-8120-1 Guidelines for Conducting Tribal Consultation.* (2004) (http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy /blm_handbook.Par.86923.File.dat/h8120-1.pdf).

The Native American Element of the CDCA Plan identifies three goals related to Native American concerns:

- Identify Native American values through regular contact and consultation with tribal entities and/or individuals, consistent with policy.
- Give full consideration to Native American values in land-use planning and management decisions, consistent with statute, regulation and policy.
- Manage and protect Native American values wherever prudent and feasible.

5.3.7.2 *Summary of Government-to-Government Tribal Consultation*

The BLM has coordinated the NEPA commenting process to partially satisfy the public involvement process for Section 106 of the NHPA (16 U.S.C. 470f) as provided for in 36 CFR 800.2(d)(3). Consultation with Indian tribes has been conducted and tribal concerns have been given due consideration, including impacts on Indian trust assets (there are no Indian trust assets within the CDCA). Federal, state, and local agencies, along with tribes and other stakeholders that were interested or affected by the BLM's decision on this project, were invited to participate in the scoping process and, if eligible, could request or be requested by the BLM to participate as a cooperating agency pursuant to NEPA, and/or a consulting party pursuant to NHPA.

The BLM has initiated government-to-government consultation with the Big Pine Paiute Tribe, the Bishop Paiute Tribe, the Fort Independence Paiute Tribe, the Lone Pine Paiute-Shoshone Tribe, and the Timbisha Shoshone Tribe as part of the scoping process for the HGLA EIS. None of those Indian tribes have treaties with the United States Government, and no trust assets managed by the BLM are within the HGLA. On October 7, 2009, the BLM sent letters via certified mail to the five aforementioned Indian tribes, inviting them to participate in the scoping and consultation process. Appendix F contains a representative letter to the Tribes. The letter discussed the HGLA, its location, NEPA and NHPA process, scoping locations, and contact information.

Native American Tribes participating in the Scoping Process requested an opportunity for additional involvement, particularly through the Section 106 consultation process (see Section 5.3.8). They are concerned about extraction of resources from the land; the benefit to the Tribes from the proposed action; impacts on spiritually important sites; impacts to Coso Hot Springs; the effects of the proposed action on the water table; the need for new transmission lines; and whether the new facilities could prohibit access to traditional lands. They also stated that geothermal development in the leasing area could conflict with their traditional values and that impacts on Native American values are not amenable to mitigation. Also expressed was the desire to have tribal monitors present in the event of any surface disturbing activities.

The BLM has received responses from two Indian tribes – the Big Pine Paiute Tribe on November 20, 2009 and the Bishop Paiute Tribe on January 21, 2010. Comments and recommendations in the November 20, 2009 response letter from the Big Pine Paiute Tribe included:

- Need for timely tribal notification of projects by the BLM;
- Relationship of the HGLA to the Coso Known Geothermal Resource Area;
- Long-term viability of geothermal energy;
- Denial of access to the land in the leasing area;
- Overuse of water to the extent that plant and animal species and habitats would be harmed; and
- The need for the EIS to address impacts to wetlands, regional hydrology, vegetation, wildlife, rare plant and animal species, geology, aesthetics and scenic values, recreation, dust generation, as well as cumulative impacts.

Comments and recommendations in the January 21, 2010, response letter from the Bishop Paiute Tribe included:

- Information on the project boundaries and design;
- Results of cultural resource records searches and cultural resource surveys;
- The need for a visit to the HGLA area;
- Recommended that qualified archaeologists perform future surveys prior to any development;
- Recommended that cultural resource monitors be used during surveys and ground disturbance; and
- Copies of all cultural resource documentation.

Comments received from the Tribes are discussed in Section 5.4. Government-to-government consultation for this EIS is ongoing. The BLM will continue to consult with interested tribes and will continue to keep all tribal entities informed about the NEPA process for this EIS.

At a meeting on July 19, 2011, the BLM Project Manager and Acting Field Office Manager briefed the Tribal Council of the Big Pine Paiute on the pending Draft EIS.

On July 21, 2011, the BLM Project Manager provided a field briefing and site tour to the Vice-Chairman of the Timbisha Shoshone, a member of the Big Pine Paiute Tribal Council, and two members of the Kern Indian Community.

On August 16, 2011, the BLM Project Manager provided a second field briefing and site tour to representatives of the Lone Pine Paiute-Shoshone Tribe, including the Tribal Historic Preservation Officer and the Tribal Environmental Coordinator. Also in attendance were representatives of the Bishop Paiute Tribe, including the Tribal Environmental Coordinator, the Tribal Historic Preservation Officer, and a Tribal Cultural Committee Member.

In the discussions noted above, no specific TCPs, archaeological sites, locations of important historic events, sacred sites, sources of raw material used to make tools or sacred objects, or traditional hunting and gathering areas have been identified within the HGLA. In contrast, the idea that the entire landscape is sacred, was expressed. Additionally, no specific sites have been identified as eligible for listing in the NRHP.

5.4 SUMMARY OF COMMENTS RECEIVED

During the scoping process, the BLM received 14 comment letters and numerous verbal comments during the scoping meetings. Below is a summary of the issues and concerns that were used to determine the scope and significant issues to be analyzed in the Draft EIS. A detailed summary of the public scoping effort, and document issues and concerns expressed during scoping may be found in the Scoping Report (see Appendix H).

5.4.1 Purpose and Need

A number of commenters were concerned about the impacts of potential geothermal exploration, development, and utilization. They requested identification of suitable and non-suitable locations for geothermal resources. The public inquired about the anticipated amount of generation, the power plant type and lifespan, and cooling methods. Many commenters requested that the quantity of water needed, and its source, be identified.

A discussion of the Plan Amendment to the CDCA Plan in regards to the Geothermal Programmatic EIS and HGLA was requested. Some scoping meeting attendees were interested in the relationship of the HGLA to the Deep Rose Geothermal Exploration Project and the three pending lease applications, as well as the connection to Coso Geothermal Fields.

5.4.2 Alternatives

It was recommended that a reasonable range of alternatives, including the no action alternative, be analyzed. The following alternatives were suggested by the public and agencies: smaller leasing areas, alternative geothermal facility designs, and alternative water sources. There was also concern regarding the lack of a competitive bidding process for leasing of government lands for other renewable energy development, such as solar and wind, and multiple uses of the land.

5.4.3 Air Quality

Consideration of potential impacts caused by windborne dust and pollution, carbon dioxide emissions, and impacts to air quality in Rose Valley was recommended. It was also suggested that any program-related emission contributions to non-attainment areas be addressed, and that greenhouse gases and global warming be addressed.

5.4.4 Biological Resources

Concern was expressed for the potential loss of water resources in Rose Valley, and for the potential impacts it may cause to habitat and vegetation. A member of the public requested a surface water baseline study to analyze the potential impacts of surface water withdrawal to the local ecosystem. Analysis of riparian habitats, sensitive natural communities, natural springs, and artesian wells throughout the Rose Valley was also suggested.

Concern was also expressed over the loss of habitat for the Mojave ground squirrel and Desert Tortoise. The Naval Air Weapons Station (NAWS), China Lake expressed concerned about the West Mojave (WEMO) Plan's compensation ratios for the Mojave ground squirrel. They were also concerned with the potential to exceed the disturbance threshold. A member of the public also requested that impacts to vegetation, animals, and insects be addressed. Coordination with the California Department of Fish and Game was requested.

5.4.5 Geothermal Resources

An organization requested the identification of the size and composition of existing geothermal resources. It was requested that the amount of electrical production from geothermal resources be based upon the size and extent of the reservoir. It was also requested that preservation of the geothermal reservoirs and long-term management be addressed. Attendees were concerned about the seismic activity in the area, and depletion of underground water basins. There was concern regarding potential impacts to the Coso Geothermal Power Plant and operations, as well as to the Coso Hot Springs. Attendees were interested in the cumulative impacts of a number of geothermal projects (existing and future) in close proximity to the HGLA.

5.4.6 Hazards and Hazardous Materials

There was concern regarding the potential for hazardous substance generation by future development in the HGLA, and treatment and disposal of hazardous substances. An analysis of wastewater and emission hazards to the public, and potential impacts from heat emissions, was requested.

5.4.7 Land Use / Agriculture / Recreation

Some scoping meeting attendees are concerned about the relationship of a number of desert management plans such as the CDCA Plan, the Northern and Eastern Mojave (NEMO) Plan, and the West Mojave (WEMO) Plan with the proposed activities in the HGLA, and with potential land use conflicts. The HGLA contains roads utilized by recreational off-highway vehicles, and the public is concerned about decreased access and potential impacts to recreation. There is also concern regarding agricultural operations in the Rose Valley, and regarding the potential impacts to water well owners. The NAWS, China Lake is concerned about development and operations activity conflicts with flight paths and military special use areas.

5.4.8 Noise and Electromagnetic Fields (EMF)

An organization requested evaluation of noise generation and projected noise levels from development in the HGLA, and evaluation of potential impacts to workers and wildlife.

5.4.9 Public Health & Safety

The public is concerned about potential impacts to human health and safety and requested that the potential for wastewater and emission hazards to the public be analyzed.

5.4.10 Socioeconomics

Inyo County inquired about the potential for creation of jobs and revenue generation for the County. The County requested consideration of the potential impacts to the population and housing, and potential for socioeconomic impacts or adverse impacts to the Coso Geothermal Power Plant.

5.4.11 Traffic and Transportation

The California Department of Transportation was concerned about potential highway transportation issues on US 395, such as highway access points for future facilities and transport of construction materials and workforce.

5.4.12 Utilities & Public Services

Scoping meeting attendees questioned whether adequate electrical transmission was available to transfer the geothermal energy to the load centers, and inquired about plans to upgrade the existing transmission lines or need to construct a new substation.

5.4.13 Visual Resources

The Rose Valley supports a number of recreational uses and there is concern regarding visual impacts from the construction of structures and geothermal facilities.

5.4.14 Water Resources

Attendees were concerned about the increasing scarcity of water in California, especially in Rose Valley. Most of the comments received inquired about the water needs for geothermal energy development and production and questioned the source and amount of water appropriations. Rose Valley residents were very concerned about any potential reductions to water resources and the protection of watersheds, water rights, and nearby public lands. The public inquired about the presence of a connection between the GeoReservoir (Coso geothermal source aquifer) and the water basins in the HGLA, and requested evaluation of potential impacts from the use and consumption of the GeoReservoirs (Coso or HGLA geothermal source aquifer) on local water basins. The Native American Tribes were also concerned about the close proximity of the Coso Hot Springs to the HGLA and potential impacts to the hot springs. There was concern for the short and long-term impacts of water extractions.

5.4.15 Cumulative Effects

Many commenters were concerned about the cumulative impacts from existing and proposed geothermal projects such as the Deep Rose and Coso Geothermal Fields. There was also concern regarding large-scale, non-geothermal operations in the vicinity of the HGLA, such as LADWP operations, Owens Lake Dust mitigation, water utilization by Coso's Hay Ranch Water Extraction and Delivery System, and livestock grazing. They were especially concerned about the increasing scarcity of water in California and the needs for groundwater extraction by these projects. The public was concerned that the reasonable foreseeable development scenario was estimated to be too conservative, and may underestimate potential cumulative impacts and future projects and development. Cumulative effects should include an inventory and analysis of the following resources: wetlands (all springs and seeps), regional hydrology, vegetation, wildlife, rare plant and animal species, geology, aesthetic/scenic values, recreation, and dust generation. In addition to geothermal energy development, an evaluation of potential cumulative impacts with future solar and wind energy developments was requested.

5.4.16 Other Comments

The Native American Tribes, Inyo County planners, and local agencies requested additional coordination with and notification by the BLM. A comment was received that questioned a lease applicant's experience and knowledge of geothermal resource exploration and development, and financial capability. Consideration of previous studies, reports, evidence, and comments prepared for projects, such as the Coso Project, was suggested. An organization also requested production of public records in connection with the HGLA.

THIS PAGE INTENTIONALLY LEFT BLANK.

CHAPTER 6

LIST

OF

PREPARERS

THIS PAGE INTENTIONALLY LEFT BLANK.

CHAPTER 6 PREPARERS AND CONTRIBUTORS

6.1 BUREAU OF LAND MANAGEMENT

Hector Villalobos	Ridgecrest Field Manager
Peter Godfrey	Project Manager/Hydrologist
John Dalton	Planning and Environmental Coordinator
Lynnette Elser	Planning and Environmental Coordinator
Sandra McGinnis	Planning and Environmental Coordinator
Jeff Childers	Planning and Environmental Coordinator
James Haerter	Geothermal Program Lead
Sean Hagerty	Geologist, Mineral Materials Program Lead
Michael Lystad	Petroleum Engineer Technician
Linn Gum	Supervisory Geologist
Robert Pawelek	Supervisory Resource Management Specialist
Craig Beck	Supervisory Outdoor Recreation Planner
Shelley Ellis	Wildlife Biologist
Carrie Woods	Wildlife Biologist
Kim Marsden	Wildlife Biologist
Glenn Harris	Natural Resource Specialist
Noel Ludwig	Hydrologist
Marty Dickes	Wilderness Specialist
Chris Roholt	Wilderness Specialist
Mike Lystad	Petroleum Engineer
Donald Storm	Archaeologist
Rolla Queen	Archaeologist
Tiffany Thomas	Archaeologist
Randy Porter	Geologist
Elaine Hanson	Realty Specialist
Paul Rodriquez	Realty Specialist
Brandon Anderson	Realty Specialist
Peg Margosian	GIS Specialist
Charlee Christie	Program Assistant
Stacy Booth	Administrative Support

6.2 POWER ENGINEERS, INC.

Jim Jensen	Project Director
Mike Strand	Project Manager
Jon Wiese	Project Coordinator/Traffic
Randy Simpson	Technical Advisor
Tom Euler	Technical Advisor
Heidi Horner	Technical Editor

Karen Cadavona	Public Involvement
Kurt Bell	Noise
Holly Cunha	Soils
Linda Erdmann	Water Resources
Vanessa Santistevan	Biological Resources
Jim Rudolph	Cultural/Paleontological Resources & Native American Concerns
Katherine Knapp	Cultural/Paleontological Resources & Native American Concerns
Gina Fegler	Visual Resources
Mark Schaffer	Land Use/Recreation/Public Services
Mike Serrano	GIS Specialist
Tim Hazekamp	GIS Specialist
Kira Kefer	Document Production
John Everingham	Quality Assurance/Quality Control

6.3 SCIENTIFIC RESOURCES ASSOC.

Valorie Thompson	Air Resources

6.4 GEOLOGICA, INC.

Jill Haizlip	Geothermal Resources
Daniel Matthews	Hydrology

6.5 ECOPLANERS, INC.

David Clark	Socioeconomics

CHAPTER 7

REFERENCES

THIS PAGE INTENTIONALLY LEFT BLANK.

CHAPTER 7 REFERENCES

Avian Power Line Interaction Committee (APLIC). 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA.

Bartholomew, G. A., and J. W. Hudson. 1960. Mammalian hibernation: aestivation in the Mojave ground squirrel, Citellus Mojavensis. Mus. Comp. Zool. Bull. 124:193-208.

Bauer, C.M., 2002: "The Hydrogeology of Rose Valley and Little Lake Ranch, Inyo County, California." Master's thesis, California State University at Bakersfield, 150 p.

Beck, Craig. 2009. BLM-Ridgecrest Field Office, personal communication with Mark Schaffer, POWER Engineers. November 15, 2009.

Beier, P. and S. Loe. 1992. A checklist for evaluating impacts to wildlife movement corridors. Wildlife Society Bulletin 20: 434-440.

Berry, K.H. 2008. Threats to Desert Tortoises and Their Habitats. Introduction to Desert Tortoise Surveying, Monitoring, and Handling Techniques Workshop. The Desert Tortoise Council. Ridgecrest, CA. October 25-26, 2008.

Bevanger, K. 1994. Bird interactions with utility structures: collision and electrocution, causes and mitigating measures. Ibis 136: 412-425.

_____. 1998. Biological and conservation aspects of birds mortality caused by electricity power lines: a review. Biological Conservation 86: 67-76.

Bhattacharyya, J. and Lees, J. M. 2002, Seismicity and seismic stress in the Coso Range, Coso geothermal field, and Indian Wells Valley region, southeast-central California, in Glazner, A.F., Walker, J.D., and Bartley, J.M., eds., Geologic Evolution of the Mojave Desert and Southwestern Basin and Range: Boulder Colorado, Geologic Society of America Memoir 195, p. 243-257.

_____. 2002; Seismicity and seismic stress in the Coso Range, Coso geothermal field, and Indian Wells Valley region, southeast-central California, Geological Society of America, Memoir 195, p. 243-257.

Bloomfield, K.K., Moore, J.N., & Neilson, R. (2003, March-April). CO2 Emissions from Geothermal Energy Facilities are Insignificant Compared to Power Plants Burning Fossil Fuels. Geothermal Resources Council Bulletin, 77-79.

Bondello, M. C. and B. H Brattstrom. 1979. The Experimental Effects of Off-Road Vehicle Sounds on Three Species of Desert Vertebrates. Fullerton, CA, Department of Biological Sciences, California State University.

Bureau of Land Management (BLM). 1979. BLM Manual 6740, "Wetland Riparian Area Protection and Management".

_____. 1980. Field Ecology Technical Report on the Coso Geothermal Study Area in support of the Coso Geothermal Development Environmental Statement. Prepared by Rockwell International. California.

_____. 1980a. Proposed Leasing with the Coso Known Geothermal Resource Area (KGRA): Final Environmental Impact Statement.

_____. 1980b. California Desert Conservation Area Plan Environmental Impact Statement (EIS). Desert District, Riverside, California.

_____. 1985. June 1985. Management Plan for the Rose Spring Area of Critical Environmental Concern (CA-06-ACEC-7). Ridgecrest Resource Area. Approved July, 1985. California Desert District, Moreno Valley, CA.

_____. 1986a. Manual H-8410-1 - Visual Resource Inventory. BLM. http://www.blm.gov/nstc/VRM/8410.html

_____. 1986b. Manual H-8431. Visual Resource Contrast Rating. BLM. http://www.blm.gov/nstc/VRM/8431.html.

_____. 1999. The California Desert Conservation Area Plan 1980 as amended. Bureau of Land Management, Desert District. Riverside California.

_____. 1999a. Desert Tortoise Biological Evaluation: Proposed Management Prescriptions and Management Areas Identified for the Conservation of the Desert Tortoise (Gopherus agassizii) in the West Mojave Desert, California. Unpublished report prepared by the West Mojave Team to document evaluations completed by the U.S. Fish and Wildlife Service and California Department of Fish and Game. Barstow, CA.

_____. 2000. West Mojave Plan Draft Evaluation Plan. Suggested Conservation Strategies for Mojave Ground Squirrel. Working Draft September 14, 2000.

_____. 2004. Plans and Plan Amendments – California Desert Conservation Area (1980-2004). CD (Disk 1). California Desert District, Moreno Valley, CA.

_____. 2005. Final Environmental Impact Report and Statement for the West Mojave Plan, A Habitat Conservation Plan and California Desert Conservation Area Plan Amendment. Vol. I and II. California Desert District, Moreno Valley, CA. January 2005.

_____. 2005. Land Use Planning Handbook, BLM Handbook H-1601-1. March 11, 2005.

_____. 2007. Final Environmental Impact Statement for the Truckhaven Geothermal Leasing Area. El Centro Field Office, October 2007.

_____. 2007a. Fossil Falls. Bureau of Land Management, Ridgecrest Field Office. Ridgecrest, California http://www.blm.gov/ca/st/en/fo/ridgecrest/fossil.html. Accessed November 27, 2009.

_____. 2007b. Environmental Assessment, Livestock Grazing Authorization. Olancha Common Allotment. BLM Ridgecrest Field Office, Ridgecrest, CA.

_____. 2008. Environmental Assessment, Livestock Grazing Authorization. Tunawee Common Allotment. BLM Ridgecrest Field Office, Ridgecrest, CA.

_____. 2008. Final Programmatic Environmental Impact Statement for Geothermal Leasing in the Western United States. Volume I: Programmatic Analysis.

_____. 2008. Hay Ranch Water Extraction and Delivery System Environmental Assessment. BLM Ridgecrest Field Office, Ridgecrest, CA.

_____. 2008. Record of Decision and Resource Management Plan Amendment for Geothermal Leasing in the Western United States.

_____. 2009. Special status plants of the Ridgecrest Field Office. Ridgecrest, CA. [accessed at http://www.blm.gov/ca/pa/ssp/fo/ridssp.htm on 19 November 2009].

_____. 2009. Environmental Assessment, Livestock Grazing Authorization. Lacey-Cactus-McCloud Allotment. BLM Ridgecrest Field Office, Ridgecrest, CA.

_____. 2009. Geocommunicator, various reports. Online database provided at: http://www.geocommunicator.gov/blmMap/Map.jsp?MAP=LAND

_____. 2009. Land & Mineral Legacy Rehost 2000 System, Public Mining Claims Report. Online database provided at: http://www.blm.gov/landandresourcesreports/rptapp/menu.cfm?appCd=2

_____. Title 43 Code of Federal Regulations (CFR), Subpart 8364.1(c) Public Lands – Interior, Closures and Restrictions.

BLM and U.S. Forest Service. 2008. Final Programmatic EIS for Geothermal Leasing in the Western United States. Washington, D.C.

California Air Resources Board (CARB). 2010. Ambient Air Quality Standards Chart. http://www.arb.ca.gov/research/aaqs/aaqs2.pdf

_____. 2010. ADAM Air Quality Data Statistics. http://www.arb.ca.gov/adam/topfour/topfourdisplay.php

California Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR). Bureau of Land Management, Ridgecrest Field Office. Final Draft Environmental Assessment/Initial Study: Deep Rose Geothermal Exploration Project, Inyo, California. Prepared by Epsilon Systems Solutions, Inc.

California Department of Finance (CDOF). 2007. Population Projections for California and Its Counties 2000-2050, Sacramento, California, July.

_____. 2009. E-4 Population Estimates for Cities, Counties and the State, 2001–2009, with 2000 Benchmark. Sacramento, California, May.

_____. 2009a. Inyo County Profile. http://www.dof.ca.gov/HTML/FS_DATA/profiles/inyo.xls

California Department of Fish and Game (CDFG) 2000. Guidelines for assessing the effects of proposed projects on rare, threatened and endangered plants and natural communities. May 8, 2000. Available at: http://www.dfg.ca.gov/whdab/pdfs/guideplt.pdf

_____. 2008. California Interagency Wildlife Task Group. 2008. CWHR version 8.2 personal computer program. Sacramento, CA.

_____. 2009. Natural Diversity DataBase (RareFind 4; CNDDB). Electronic database. Sacramento, California. DataBase search for the following 7.5-minute USGS quadrangles: Coso Junction, Cactus Peak, Centennial Flat, Haiwee Reservoirs, Little Lake, Upper Centennial Flat, Volcano Peak. [accessed 19 November 2009]. The Resources Agency, Department of Fish and Game, Biogeographic Data Branch, California Natural Diversity Database, Sacramento, CA.

California Department of Water Resources (CDWR). 2004. California's Groundwater Bulletin 118, South Lahontan Hydrologic Region, Rose Valley Groundwater Basin. Updated February 27, 2004. http://www.water.ca.gov/groundwater/bulletin118/south_lahontan.cfm.

California Employment Development Department. 2009. Labor Market Information Division, Industry Employment & Labor Force - by Annual Average, March 2008 Benchmark. October 16.

_____. 2009a. Labor Market Information Division, Monthly and Annual Employment and Unemployment Data. http://www.labormarketinfo.edd.ca.gov/cgi/dataanalysis/ areaselection.asp?tablename=labforce Accessed November 2, 2009.

_____. 2009b. Labor Market Information Division, Monthly Labor Force Data for Cities and Census Designated Places (CDP), Annual Average 2008, Revised. March 20.

California Energy Commission (CEC) 2009a. *Staff Assessment for the City of Palmdale Hybrid Power Plant.* December. Web site http://www.energy.ca.gov/2009publications/CEC-700-2009-018/CEC-700-2009-018-PSA.PDF

_____. 2009b. *Staff Assessment for the Beacon Solar Project.* October. Web site http://www.energy.ca.gov/2009publications/CEC-700-2009-005/CEC-700-2009-005-FSA.PDF

_____. 2010a. *Staff Assessment for the Abengoa Mojave Solar Project.* March. Web site http://www.energy.ca.gov/2010publications/CEC-700-2010-003/CEC-700-2010-003.PDF

_____. 2010b. *Staff Assessment and Draft Environmental Impact Statement and Draft California Desert Conservation Plan Amendment for the Ridgecrest Solar Power Project.* March. Web site http://www.energy.ca.gov/2010publications/CEC-700-2010-008/CEC-700-2010-008.PDF

California High-Speed Rail Authority (CHSR). 2009. *Report to the Legislature 2009.* Web site http://www.cahighspeedrail.ca.gov/images/chsr/20091223222521_CHSRA_Business_Plan_Dec_2009.pdf

California Invasive Plant Council (Cal-IPC). 2006. California Invasive Plant Inventory. Cal-IPC Publication 2006-02. California Invasive Plant Council, Berkeley. Available at: www.cal-ipc.org.

California Native Plant Society (CNPS). 2009. CNPS On-line Inventory. Available at: www.cnps.org [accessed 19 November 2009].

California Natural Resources Conservation Service (NRCS), United States Department of Agriculture. 2001. Benton-Owens Valley Soils Survey for Haiwee Reservoir, Inyo County, California. 2001.

_____. 2010. "Soil Survey of Benton-Owens Valley Area, California, Parts of Inyo and Mono Counties." Web Soil Survey. NRCS, USDA. January 19, 2010. http://websoilsurvey.nrcs.usda.gov/ (accessed January 19, 2010).

_____. 2010. Web Soil Survey. January 13, 2010. http://websoilsurvey/nrcs.usda.gove/app/WebSoilSurvey.aspx (accessed January 14, 2010).

California Regional Water Quality Control Board, Lahontan Region (RWQCB). 2001. Draft Progress Report, Total Maximum Daily Load for Copper, Haiwee Reservoir, Inyo County, California. June 2001.

_____. 2005. Water Quality Control Plan for the Lahontan Region, North and South Basins.

California State Military Museum. n.d. Naval Air Weapons Station, China Lake. California State Military Department. http://www.militarymuseum.org/NAFInyokern.html. Accessed November 27, 2009.

California State Water Resources Control Board (SWRCB). 2009. California's 2006 Clean Water Act Section 303(d) List of Water Quality Limited Segments. www.waterboards.ca.gov/water_issues/programs/tmdl/303d_lists 2006_epa.html .

Campbell, KM, et al. 2006. Simultaneous microbial reduction of iron(III) and arsenic(V) in suspensions of hydrous ferric oxide. Environmental Science and Technology 40(19): 5950-5955.

Campbell, K. 2006. Biogeochemical mechanisms of arsenic mobilization in Haiwee Reservoir sediments. http://thesis.library.caltech.edu/5043/13/Campbell_Thesis_Complete.pdf

Carunchio. 2009. County Administrative Officer, submitted to the Inyo County Board of Supervisors. Fiscal Year 2009-2010 Recommended Budget: Budget Message. August 27.

Christenson, B.W., B. Mack Kennedy, M.C. Adams, S.C. Bjornstad, and C. Buck. 2007, Chemical and Isotopic Characteristics of the Coso East Flank Hydrothermal Fluids: Implications for the Location and Nature of the Heat Source, Proceedings, 32nd Workshop of Geothermal Reservoir Engineering Stanford University, Stanford, California, January 22-24, 2007, SGP-TR-183.

City of California City. 2009. City of California City Estimated Fund Balances at 6/30/2010. June 6. http://www.californiacity.com/20092010ccapprovedbudget.pdf

City of Ridgecrest. 2009. City of Ridgecrest General Plan Update: Final Environmental Impact Report. September.

_____. 2009a. Finance Department. City of Ridgecrest And Ridgecrest Redevelopment Agency Draft Budget 2009-10. June 2.

Clayton, Michael. 2009. Haiwee Visual Resource Management (VRM) Inventory Study, Fall 2009.

Clel, Georgetta. 1972. Golden Fleece in Nevada. Venture Publishing Company, Reno, NV.

Cogstone Resource Management, Inc. 2007. *Paleontological Evaluation of 2008 Supplemental Control Requirements for the Owens Valley PM10 Planning Area Demonstration of Attainment State Implementation Plan, Inyo County, California.* Cogstone Resource Management, Inc. Santa Ana, California.

Coso Operating Company, LLC. 2008. Hay Ranch Water Extraction and Delivery System Environmental Assessment. December 2008.

Dorp, D. van and P.F.M. Opdam. 1987. Effects of patch size, isolation and regional abundance on forest bird communities. Landscape Ecology 1:59-73.

Ducea, MN, 2001: "The California Arc: Thick Granitic Batholiths, Eclogitic Residues, Lithospheric-Scale Thrusting, And Magmatic Flare-Ups", Geological Society of America Today, 11, 4-10, 2001.

Duffield, W. A., Bacon, C. A., and Dalrymple, G. B., 1980: Late Cenozoic volcanism, geochronology, and structure of the Coso Range, Inyo County, California, J. Geophys. Res. ***85*** : 2379–2380.

Egoscue, H. J. 1962. Ecology and life history of the kit fox in Tooele County, Utah. Ecology 3:481-497.

Feller, Walter. n.d. Digital-Desert: Mojave Desert, Boomtown and Mining History. http://mojavedesert.net/mining-history. Accessed November 27, 2009.

Feng, Q. and Lees, J.M. 1998. Microseismicity, stress, and fracture pattern within the Coso geothermal field, Tectonophysics, 289, 221-238, 1998.

Fenneman. N.M. 1931. Physiography of the Western United States, New York and London: McGraw Hill, Book Company Inc.

Garrett, K., and J. Dunn. 1981. Birds of Southern California. Status and distribution. Los Angeles Audubon Society, Los Angeles, CA. 408 pp.

GeoTrans, 2004: "Revised Hydrological Conceptual Model for the Rose Valley," Prepared for Coso Operating Company by GeoTrans Inc.

Greater Antelope Valley Economic Alliance. 2009. Economic Roundtable Report: 2009. Lancaster, CA.

Güler,C. 2002. Hydrogeochemical evaluation of the groundwater resources of Indian Wells-Owens Valley area, southeastern California, PhD. Thesis, Colorado School of Mines, Golden, CO.

Gum, Linn. 2009. BLM-Ridgecrest Field Office, personal communication with Mark Schaffer, POWER Engineers. November 6, 2009.

Hanson, Elaine. 2009. BLM-Ridgecrest Field Office, personal communication with Mark Schaffer, POWER Engineers. November 3, 2009.

Harris, Glenn. 2009. BLM-Ridgecrest Field Office, personal communication with Mark Schaffer, POWER Engineers. November 18, 2009.

_____. 2010. BLM-Ridgecrest Field Office, personal communication with Katherine Knapp, POWER Engineers.

Haug, E. A., B. A. Millsap and M. S. Martell _____. 1993. Burrowing Owls (Speotyto cunicularia). In A. Poole and F. Gill, editors. The birds of North America, No. 61. The Academy of Natural Sciences, Philadelphia, Pennsylvania; The American Ornithologists' Union, Washington, DC.

_____. 1993. Burrowing Owl (Athene cunicularia), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/061

Hickman, J.C. 1993. The Jepson Manual, Higher Plants of California. University of California Press, Berkeley and Los Angeles, CA. 1400 pp.

Holland, R. F. 1986. Preliminary descriptions of the terrestrial natural communities of California. California Department of Fish and Game. Unpublished report.

http://vulcan.wr.usgs.gov/Vhp/C1073/active_volcanoes_USA.html

International Code Council, Inc. 2009. International Building Code. February 2009. http://www2.iccsafe.org/states/2009ICodes/Building/Building_Frameset.html (accessed January 19, 2010).

Inyo County. 2001. General Plan, Section 9, "Public Safety Element (Noise Section), and Section 4, "Land Use Element", December 2001.

_____. 2009. *Inyo County Regional Transportation Plan.*

Inyo County Planning Department. 2001. Inyo County General Plan. Approved December 11, 2001.

Inyo County Water Department, 2009. Coso / Hay Ranch Hydrologic Monitoring, at http://www.inyowater.org/coso/default.html accessed December 4, 2009.

Jackson, D. B. and O'Donnell, J. E., 1980. Reconnaissance electrical surveys in the Coso Range, California, J. Geophys. Res. *85* : 2502–2516

Jennings, W. B. 1997. Habitat use and food preferences of the desert tortoise, Gopherus agassizii, in the western Mojave Desert and impacts of off-road vehicles. In J. Van Abbema (ed.), Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles – An International Conference, pp. 42 – 45. New York Turtle and Tortoise Society, New York.

Jepson Online Interchange. 2008. An online database for California floristics. Available at: http://ucjeps.berkeley.edu/interchange.html

Kagel, Alyssa; Bates, Diana; Gawell, Karl. 2005. A guide to geothermal energy and the environment. Washington, DC: Geothermal Energy Association. pp 28

Kern County. 2007. *Kern County General Plan.*

_____. 2009. *Alta-Oak Creek Mojave Project Draft Environmental Impact Report*. August. Web page http://www.co.kern.ca.us/planning/pdfs/eirs/AltaOakCreek

Kneebone, Penelope E. (2000) *Arsenic geochemistry in a geothermally impacted system: the Los Angeles Aqueduct.* Dissertation Pasadena, CA: California Institute of Technology.

_____. 2002. Deposition and fate of arsenic in iron- and arsenic-enriched reservoir sediments. Environmental Science and Technology 35(3): 381-386.

LaBerteaux, D.L., 2009. Biological Resource Survey at the Proposed Little Lake Wind Energy Meteorological Mast Sites, Inyo County, California. Prepared for Little Lake North Wind, LLC and Little Lake South Renewables, LLC, Broomfield, CO.

LADWP, 2009: Los Angeles Aqueduct Real-Time Data, Southern District, So. Haiwee Reservoir Elevation, at http://wsoweb.ladwp.com/Aqueduct/realtime/sdrealtime.htm accessed December 4, 2009.

Landry, R.E. 1979. Growth and Development of the Burrowing Owl. M.S. thesis, California State University, Long Beach, CA.

Leitner, P. and B. M. Leitner. 1989. First year baseline report: Coso grazing exclosure monitoring study: Coso Known Geothermal Resource Area, Inyo County, California. McClenahan and Hopkins Associates (San Mateo, CA) report, 69 pp + appendices.

_____. 1990. Second year baseline report: Coso grazing exclosure monitoring study: Coso Known Geothermal Resource Area, Inyo County, California. McClenahan and Hopkins Associates (Bethesda, MD) report, 96 pp.

Leitner, P., B. M. Leitner and J. H. Harris. 1997. Mojave ground squirrel study in the Coso Known Geothermal Resource Area, Inyo County, California, 1995 and 1996. Unpublished report prepared on behalf of CalEnergy Company, Inc. Orinda, CA.

Lennartz, S., T. Bax, J. Ayerigg, A. Davison, M., Reid, and R. Congalton. 2008. Final Report on Land Cover Mapping Methods for California Map Zones 3, 4, 5, 6, 12, and 13. USGS GAP Program: Portland, OR.

Los Angeles County Economic Development Corporation. 2009. With the Kyser Center for Economic Research. 2009-2010 Midyear Update, Economic Forecast and Industry Outlook. July 2009.

Los Angeles Department of Water and Power. n.d. The Story of the Los Angeles Aqueduct. http://wsoweb.ladwp.com/Aqueduct/historyoflaa/index.htm. Accessed November 27, 2009.

MHA Environmental Consultanting (MHA). 2008. "Coso Operating Company, Hay Ranch Water Extraction and Delivery System, Conditional Use Permit (CUP 2007-003) Application. SCH# 2007101002, Draft EIR, Inyo County, California, July 2008", Prepared for: Inyo County Planning Department by MHA Environmental Consulting.

MHA-RMT. 2009. Hay Ranch Water Extraction Project Final EIR, Inyo County Planning Department, Lone Pine, CA.; Fournier, Robert O. and J.M. Thompson, 1980,"The Recharge Area for the Coso, California, Geothermal System deduced from ∂D and ∂18O in Thermal and Non-Thermal Waters in the Region", USGS Open-File Report 80-454.; Güler, 2002; MHARMT. 2009.

Monastero, Francis C. 2002. Geothermal Development: Model for Success. Geothermal Resource Council Bulletin, September / October: 188-194.

Moose, Virgil. 2009. Subject: Comments on Proposed Haiwee Geothermal leasing Area. Letter to John Dalton, Haiwee Geothermal Leasing Coordinator, BLM. Submitted November 19, 2009 by Tribal Chairperson, Big Paine Paiute Tribe of the Owens Valley, Big Pine Indian Reservation, Big Pine, California.

Natural Resources Conservation Service (NRCS). 2010."Soil Survey of Benton-Owens Valley Area, California, Parts of Inyo and Mono Counties." Web Soil Survey. January 19, 2010. http://websoilsurvey.nrcs.usda.gov/ (accessed January 19, 2010).

NatureServe. 2008. Ecological systems of California. International Ecological Classification Standard: Terrestrial Ecological Classifications. Arlington, VA. Data current as of 18 December 2008.

Néron-Bancel. 2009. Research Associate, Geothermal Energy Association. Geothermal Revenue Under the Energy Policy Act of 2005: Income Distribution at Federal, State, and County Levels. December 14.

Parker, P.L., King, T.F., 1998. Guidelines for Evaluating and Documenting Traditional Cultural Properties, National Register Bulletin, National Register of Historic Places, National Park Service, U.S. Department of the Interior, Washington, D.C.

Porter, Randy. 2009. BLM-Ridgecrest Field Office, personal communication with Mark Schaffer, POWER Engineers. November 9 and 10, 2009.

Powers, Bob.1988. Cowboy Country. H. Clark Company, Glendale, CA.

Reheis, MC. (1997), Dust deposition downwind of Owens (dry) Lake,1991 – 1994: Preliminary findings, Journal of Geophysical Research.

Reheis, MC; Budahn, JR; Lamothe, PJ; Reynolds, RL. 2009. Compositions of modern dust and surface sediments in the Desert Southwest, United States. Journal of Geophysical Research 114: http://esp.cr.usgs.gov/info/sw/swdust/dust_composition.pdf.

Rockwell International. 1980. Soils Technical Report on the Coso Geothermal Study Area. Technical Report, Newbury Park, 1980.

_____. 1980: "Project: Geology and Hydrology Technical Report on the Coso Geothermal Study Area, In Support of: Coso Geothermal Development Environmental Statement", April 1980, prepared for U.S. Department of the Interior, Bureau of Land Management, by Rockwell International.

Rodriquez, Paul. 2009. BLM-Ridgecrest Field Office, personal communication with Mark Schaffer, POWER Engineers. November 10, 2009.

Rogers, D., C. Millar, and R. Westfall. 1996. Genetic Diversity within Species. Sierra Nevada Ecosystem Project: Final report to Congress, vol. II, Assessments and scientific basis for management options. Davis: University of California, Centers for Water and Wildland Resources, 1996.

San Diego Gas and Electric (SDG&E). 2006. Sunrise Powerlink Project Environmental Assessment. Prepared for California Public Utilities Commission. San Diego, CA.

Sawyer, J. and T. Keeler-Wolf. 1995. A manual of California vegetation. California Native Plant Society, Sacramento.

Sergio, F., L. Marchesi, P. Pedrini, M. Ferrer, and V. Penteriani. 2005. Electrocution alters the distribution and density of a top predator, the eagle owl Bubo bubo. Journal of Applied Ecology, 21:836-845.

Shuford, W.D., and Gardali, T. editors. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of bird of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, California, and California Department of Fish and Game, Sacramento.

State of California, Office of Planning and Research. 2008. R-2508 Joint Land Use Study.

Stebbins, R. C. 2003. A field guide to western reptiles and amphibians. Third edition. Houghton Mifflin Co., New York, NY. 533 pp.

Storm, Donald. 2009. Personal Communication. Archaeologist, Bureau of Land Management, Ridgecrest Field Office. Ridgecrest, California.

Thomsen, L. 1971. Behavior and Ecology of Burrowing Owls on the Oakland Municipal Airport. Condor 73:177-192.

United States Army Corps of Engineers (USACE). September 2008. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0).

United States Department of Agricultural (USDA). 2009. The PLANTS Database (http://plants.usda.gov, 20 November 2009). National Plant Data Center, Baton Rouge, LA.

United States Department of Commerce. 2000. Bureau of the Census. 2000 Census of the Population.

_____. 2000a. Bureau of the Census. 2000 Census of the Population. Table P52. Summary File 3 (SF 3).

_____. 2009. Bureau of Economic Analysis, Regional Economic Information System. Table C-4. April 2009.

_____. 2009a. Bureau of Economic Analysis, Regional Economic Information System. Table CA25N.

United States Department of Energy (DOE). 2002. Environmental Assessment for a Small-Scale Geothermal Power Plant and Direct-Use Geothermal Application at AmeriCulture Inc., Cotton City, NM. EA 1396. August 2002.

United States Environmental Protection Agency (USEPA). 2003. Primary Drinking Water Standards. www.epa.gov

_____. 2010. The Green Book Nonattainment Areas for Criteria Pollutants. http://epa.gov/airquality/greenbk/

United States Fish and Wildlife Service (USFWS). 1994a. Desert tortoise (Mojave populations) Recovery Plan. U.S. Fish and Wildlife Service, Portland Oregon. 73 pages plus appendices.

_____. 2003. Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States. Biological Technical Publication BTP-R6001-2003.

_____. 2006b. Biological opinion for the California Desert Conservation Area Plan [West Mojave Plan] (1-8-03-F*58). Dated January 9, 2006. From the Field Supervisor, Ventura Fish and Wildlife Office, Ventura, California.

_____. 2007. National Bald Eagle Management Guidelines. U.S. Fish and Wildlife Service. Portland, Oregon. 23pp.

_____. 2008. Draft revised recovery plan for the Mojave population of the desert tortoise (Gopherus agassizii). U.S. Fish and Wildlife Service, California and Nevada Region, Sacramento, California. 209 pp.

_____. 2009. Letter to POWER Engineers, December 2009. Species List for the Proposed Leasing of Geothermal Resources within the Haiwee Geothermal Leasing Area, Inyo County, California

_____. 2009c. Biological opinion for a Right-of-Way Grant for the Coso Hay Ranch Pipeline, Inyo County, California (1-8-08-F-42). Dated December 17, 2008. From Assistant Field Supervisor Ventura Fish and Wildlife Office. Ventura, California.

_____. 2010. http://www.fws.gov/ventura/speciesinfo/protocols_guidelines/).

United States Forest Service (USFS). 1997. Pacific Southwest Region. Ecological Subregions of California, Section and Subsection Descriptions. USFS. http://www.fs.fed.us/r5/projects/ecoregions.

United States Geological Survey (USGS) GAP Program. 2009. GAP Ecological Systems: California ReGAP. Portland, OR. [accessed at: http://gapanalysis.nbii.gov/portal/community/GAP_Analysis_Program/Communities/Maps,_Data,_&_Reports/Find_Updated_GAP_Regional_Data/].

United States Navy. 2007. Naval Air Weapons Station, China Lake. Final Air Installation Compatible Use Study.

Unruh, Jeffrey, Satish Pullammanappallil, William Honjas, and Francis Monastero, 2001. "New Seismic Imaging of the Coso Geothermal Field, Eastern California, Proceedings 26th Workshop on Geothermal Reservoir Engineering, Stanford University, Stanford, CA, January 2001.

Unruh, Jesse, James Humphrey and Andrew Barron, 2003; Transtensional model for the Sierra Nevada frontal fault system, eastern California, Geological Society of America, April 2003, v. 31, p. 327-330.

USGS, 2009: Comments by the U.S. Geological Survey on "Environmental Assessment for the Coso Operating Company Hay Ranch Water Extraction and Delivery System, CA Bureau of Land Management, December 2008, June 4, 2009, prepared for the U.S. Bureau of Land Management.

Voous, K.H. 1988. Owls of the Northern Hemisphere. MIT Press, Cambridge, Massachusetts.

Western Regional Climate Center (WRCC). 2010. Haiwee, California (043710). Period of Record Monthly Climate Summary. Period of Record: 5/1/1923 to 11/30/2009. http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca3710.

_____. 2010. Annual Average Temperature Records for Haiwee Meteorological Station, Station No. 043710. Available at http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca3710.

Whitmarsh, Richard S. 1997. *Geologic Map of the Coso Junction 7.5' Quadrangle, Inyo County, California.*

Williams, D. F. 1986. Mammalian species of special concern in California. California Department of Fish and Game, Sacramento, CA. 112 pp.

Williams, David V., 2004,"Hydrologic and Hydrochemical Framework of Indian Wells Valley, California: Evidence for Intrabasin Flow in the Southern Sierra Nevada" Master's Thesis, Colorado School of Mines, Golden, CO.

Wilson, Charles K., Craig H. Jones and Hersch Gilbert. 2003. "Single-chamber silicic magma system inferred from shear wave discontinuities of the crust and uppermost mantle, Coso geothermal area, California"; JGR, vol. 108; No. B5, 2226.

Wohletz, Kenneth and Heiken, Grant, 1992: Volcanology and Geothermal Energy, Chapter 5 – Coso California Geothermal Field, University of California Press; Berkeley, CA; p. 194-205.

Yousef, R. 1996. Loggerhead Shrije (Lanius ludovicianus), The Birds of Northern America Online (A. Poole, Ed.) Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http//bna.birds.cornell.edu/bna/species/231

Zarn, M. 1974. Burrowing Owl. Rep. No. 11. Habitat Management Series for Unique or Endangered Species. USDI, BLM. Technical Note T-N 250. Denver, Colorado.

Zerabel, R., C. Gall, D. Kruska, and P. Lobnitz. 1979. An Inventory of the Vascular Plants and Small Mammals of the Coso Hot Springs Area of Inyo County, California. Report prepared for the Natural Resource Management Office Public Works Department, April 1979.

THIS PAGE INTENTIONALLY LEFT BLANK.

APPENDICES

THIS PAGE INTENTIONALLY LEFT BLANK.

APPENDIX A

Best Management Practices

And

Reclamation Performance Standards

THIS PAGE INTENTIONALLY LEFT BLANK.

APPENDIX A

BEST MANAGEMENT PRACTICES AND RECLAMATION PERFORMANCE STANDARDS

1.0 BEST MANAGEMENT PRACTICES (BMPS)

Geothermal resource leases are subject to the standard stipulations and lease terms. The current lease terms, dated September 2008 and subject to changes, are found on Form 3200-24a (included at the end of this Appendix). 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 phase (see Section 2.4, Reasonably Foreseeable Development scenario). In addition, the BLM and other governmental agencies may require specific permits.

BMPs are mitigation measures applied on a site-specific basis to avoid, minimize, reduce, rectify, or compensate for adverse environmental or social impacts. They are applied to management actions to aid in achieving desired outcomes for safe, environmentally responsible resource development, by preventing, minimizing, or mitigating adverse impacts and reducing conflicts.

This section provides a list of sample BMPs that have been collected from various BLM, and other applicable agency documents addressing geothermal and fluid mineral leasing and development, including resource management plans, forest plans, and environmental reports for geothermal leasing and development. The purpose of this section is to provide a list of potential BMPs that could be incorporated as appropriate into the permit application by the lessee or could be included in the approved use authorization by the BLM as conditions of approval. When implementing new BMPs, the BLM will work with an affected lessee early in the process, to explain how BMPs may fit into their development proposals and how BMPs can be implemented in a cost effective and design appropriate manner. The BLM will discuss potential resource impacts with the lessee and seek the operator's recommended solutions. The BLM would encourage the lessee to incorporate necessary and effective BMPs into their project proposal. BMPs not incorporated into the permit application by the lessee may be considered and evaluated through the environmental review process and incorporated into the use authorization as conditions of approval or rights-of-way stipulations.

The BLM will incorporate BMPs into proposed use authorizations after appropriate review. The BMPs to be considered in nearly all circumstances include the following:

- Interim reclamation of well locations and access roads soon after the well is put into production;
- Painting of all new facilities a color that best allows the facility to blend with the background;
- Design and construction of all new roads to a safe and appropriate standard, "no higher than necessary" to accommodate their intended use; and

- Final reclamation of all disturbed areas, including access roads, to the original contour or a contour that blends with the surrounding topography.

Other BMPs are more suitable for consideration by an administrative unit on a case-by-case basis, (1) depending on their effectiveness, (2) the balancing of increased operating costs vs. the benefit to the public and resource values, (3) the availability of less restrictive mitigation alternatives that accomplish the same objective, and (4) other site specific factors. To minimize adverse impacts to resources and uses in the proposed leasing 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.

2.0 GENERAL

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

- Prior to geothermal exploration and development, a focused geotechnical survey should be conducted on potential areas of disturbance such as roads, drill pads, and power plant locations. Initial exploration (geophysics) does not disturb any land subsurface. The survey will 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. Prior to the initiation of geotechnical surveys (i.e., subsurface work as well as off-road travel), all areas of potential ground disturbance will be submitted to the appropriate environmental compliance activities (e.g., cultural resource survey, biological investigations) as determined by the BLM.

- The operator will collect available information describing the environmental and socio-cultural conditions in the vicinity of the proposed project and will provide the information to the agency.

- A monitoring program will be developed by the operator to ensure that environmental conditions are monitored during the exploration and well drilling, testing, construction, and utilization and reclamation phases. The monitoring program requirements, including adaptive management strategies, will be established at the project level to ensure that potential adverse impacts of geothermal development are mitigated. The monitoring program will identify the monitoring requirements for each major environmental resource present at the site, establish metrics against which monitoring observations can be measured, identify potential mitigation measures, and establish protocols for incorporating monitoring observations and additional mitigation measures into ongoing activities. The operator will provide results of the monitoring program to the agency in an annual report.

- Prior to commencing work, project boundaries (including access routes and staging/parking areas) will be staked or flagged, as necessary, to identify the limits of the work area. No paint or permanent discoloring agents will be applied to rocks or vegetation to indicate survey or construction activity limits. Work area footprints will be restricted to existing disturbed areas to the extent feasible. No work will occur outside defined project limits.

2.1 Air Quality

- The operator will coordinate with the Great Basin Unified Air pollution Control District (GBUAPCD) to develop and implement an air quality monitoring plan.
- Drilling, well testing and geothermal production will comply with appropriate GBUAPCD hydrogen sulfide emission limits.
    - The operator will prepare and submit to the agency an Equipment Emissions Mitigation Plan for managing diesel exhaust. An Equipment Emissions Mitigation Plan will identify actions to reduce diesel particulate, carbon monoxide, hydrocarbons, and nitrogen oxides associated with construction and drilling activities. The Equipment Emissions Mitigation Plan will require that all drilling/construction-related engines are maintained and operated as follows:
    - Are tuned to the engine manufacturer's specification in accordance with an appropriate time frame.
    - Do not idle for more than five minutes (unless, in the case of certain drilling engines, it is necessary for the operating scope).
    - Are not tampered with in order to increase engine horsepower.
    - Include particulate traps, oxidation catalysts, and other suitable control devices on all drilling/construction equipment used at the project site.
    - Use diesel fuel having a sulfur content of 15 parts per million or less, or other suitable alternative diesel fuel, unless such fuel cannot be reasonably procured in the market area.
    - Include control devices to reduce air emissions. The determination of which equipment is suitable for control devices should be made by an independent Licensed Mechanical Engineer. Equipment suitable for control devices may include drilling equipment, work over and service rigs, mud pumps, generators, compressors, graders, bulldozers, and dump trucks.
- Hydrogen sulfide emissions would be abated during well testing, for example, through the injection of hydrogen peroxide and sodium hydroxide in to the test line.

<u>Construction Best Management Practices</u>

Fugitive Dust Suppression Program (Construction)

- Watering of unpaved roads and disturbed areas at least twice per day. Increase watering frequency when wind speeds exceed 15 miles/hour.

- Limiting speed of vehicles in construction areas to 25 miles per hour or less.
- Prior to soil disturbance, install windbreaks at the windward sides of construction areas. The windbreaks shall remain in place until the soil is either stabilized or permanently covered.
- Wet or cover excavated and stockpiled soil.
- Cover all trucks hauling dirt, sand, soil or other loose materials and maintain at least six inches freeboard between the top of the load and the top of the trailer.
- Maintain cargo compartments so that no spillage or loss of material can occur.
- Clean cargo compartments for all haul trucks at the delivery site, after removal of materials.
- Prior to entering a public roadway, employ tire cleaning and gravel ramps to limit accumulated mud and dirt deposited on the roads.
- Cleanup of spillage and material tracked out or carried out into a paved road surface within 8 hours.

Well Drilling Emissions and Testing Issues (Construction)

- Contractors will be hired by the lessee to conduct well drilling activities. These contractors will be required to have Statewide Portable Equipment Registrations (SPER) issued by the California Air Resources Board (CARB) or be permitted by Great Basin Unified Air Pollution Control District (GBUAPCD) for their diesel fueled engines. Typical SPER requirements for these types of engines include:
- The opacity shall be limited to 20 percent or less.
- PM_{10} emissions shall be limited to less than 0.1 grain per dry standard cubic feet (DSCF) corrected to 12 percent CO.
- Limit engine idling time to no more than five minutes and shut down equipment when not in use.
- The well flow testing shall be completed as expeditiously as possible.
- Well drilling activities shall use engines that meet or exceed the following EPA off-road engine emission standards: Tier 2 engines (at a minimum) from 2010 to 2015; Tier 3 engines (at a minimum) from 2015 to 2020; Tier 4 engines after 2020.
- The brine from a flow test is routed to a well test unit designed to minimize the release of entrained brine, which contributes to the particulate matter and metals

release. Other mitigation measures include: Brine flow rates shall be limited to 800,000 lbs/hr for both production wells and injection wells (CEOE 2003b, Response #3a).

- Flow tests shall last less than 96 hours.
- Consider the use of hydrogen peroxide to control the hydrogen sulfide (H_2S) emissions during well flow tests and initial commissioning.

Heavy Duty Diesel Equipment (Construction)

- Limit engine idling time to no more than five minutes and shut down equipment when not in use.
- Perform regular preventive maintenance to prevent emission increases due to engine problems.
- Use ultra-low-sulfur fuel meeting California standards for motor vehicle diesel fuel.
- All large construction diesel engines which have a rating of 100 horsepower (hp) or more shall be equipped with catalyzed diesel particulate filters (soot filters), unless certified by engine manufacturers or the on-site air quality control mitigation measures (AQCMM) that the use of such devices is not practical for specific engine types.
- Paving of all major access/egress routes to the project site and requiring construction workers and deliveries to take paved routes to and from the project site.
- Suspension of fugitive dust causing activities under windy (i.e. sustained winds >25 mph) conditions.

Operational Best Management Practices

Fugitive Dust Suppression Program (Operations)

- All access and internal power plant roads shall be paved.
- Limit vehicle speeds and water unpaved access roads to well pads.
- Direct load haul trucks with recently dewatered filter cake.
- Use wind break shields or structures at all exposed operation areas as feasible.
- Cover all haul trucks and maintain at least six inches of freeboard between the top of the load and the top of the trailer.
- Maintain cargo compartments so that no spillage or loss of material can occur.

- Clean cargo compartments for all haul trucks at the delivery site, after removal of materials.
- Prior to entering a public roadway, employ tire cleaning and gravel ramps to limit accumulated mud and dirt deposited on the roads. Cleanup of spillage and material tracked out or carried out into a paved road surface within eight hours.
- Designate a person to oversee the implementation of the fugitive dust control program.
- Employ electric motors for operations and maintenance equipment when feasible.

Cooling Tower Mitigation Measures (Operations)

- H_2S shall be controlled using a LO-CAT System with a control efficiency of 99.5 percent (CEOE 2002a, Appendix G.3).
- In addition to the LO-CAT System for H_2S abatement, the project will include a polishing system using a solid bed H_2S removal scavenger system.
- Evaluate ammonia removal technologies and assess whether an additional ammonia control system is feasible.
- Benzene shall be controlled using carbon absorbers with a control efficiency of 95 percent (CEOE 2002a, Appendix G.3).
- Offgassing of H_2S shall be minimized using oxidizers designed to oxidize at least 90 percent of the H_2S in the condensate (CEOE 2003b, Response #3d).
- The cooling tower shall be designed and built with a drift eliminator, such that the drift rate does not exceed 0.0005 percent (CEOE 2002b, DR#5).
- Hexavalent chromium containing compounds will not be used in the circulating water.

Filter Cake Handling Mitigation Measures

- Direct load filter cake into trucks, trailers or bins as it is generated.
- Tarp trailer and bins immediately after loading.
- Use sulfate scale inhibitors to minimize radioactivity from radium (Ra226 and Ra228) and radon from the silica filter cake.

2.2 Noise

- The operator will take measurements to assess the existing background noise levels at a given site and compare them with the anticipated noise levels associated with the proposed project.
- Within two miles of existing, occupied residences, geothermal well drilling or major facility construction operations will be restricted to non-sleeping hours (7:00 am to 10:00 pm).
- All equipment will have sound-control devices no less effective than those provided on the original equipment. All construction equipment used will be adequately muffled and maintained.
- All stationary construction equipment (i.e., compressors and generators) will be located as far as practicable from nearby residences.
- If blasting or other noisy activities are required during the construction period, nearby residents will be notified by the operator at least one hour in advance.
- Explosives will be used only within specified times and at specified distances from sensitive wildlife or streams and lakes, as established by the federal and state agencies.

2.3 Soils

- Erosive soils (defined as having severe or very severe erosion potential by the Natural Resources Conservation Service) on slopes greater than 30 percent should be protected to minimize the potential for adverse impacts.
- The operator will perform a detailed geotechnical analysis prior to the construction of any structures; so they will 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). Structures and facilities will be designed and constructed in accordance with seismic safety standards.
- Silt fencing, waddles, hay bales, and other erosion control devices will be used on areas at risk of soil movement from wind and water erosion.
- Mulch will be used if necessary to control erosion, create vegetation micro-sites, and retain soil moisture and may include hay, small-grain straw, wood fiber, live mulch, cotton, jute, or synthetic netting. Mulch will be free from mold, fungi, and certified free of noxious or invasive weed seeds.
- Adequate drainage control devices and measures will be incorporated into road and well pad design at sufficient intervals and intensities to adequately control and direct surface runoff above, below, and within the road and well pad environments to avoid erosive concentrated flows.

- The amount of vegetation cleared will be kept to the minimum necessary to accommodate all necessary project components.

- Water will be applied to disturbed areas and windrowed topsoil during construction to reduce the impacts to soil from wind erosion.

- During initial construction, and prior to completion of construction, pre-interim reclamation stormwater management actions will be taken to ensure disturbed areas are quickly stabilized to control surface water flow and to protect both the disturbed and adjacent areas from erosion and siltation. This may involve construction and maintenance of temporary silt ponds, silt fences, berms, ditches, and mulching.

- Where possible, access roads should be located to follow natural contours and minimize side hill cuts and fills. Excessive grades on roads, road embankments, ditches, and drainages should be avoided, especially in areas with erodible soils. Project vehicles should be restricted to designated roads and well pad areas. Roads should be designed so that changes to surface water runoff are minimized and new erosion is not initiated.

- Access roads and onsite roads should be surfaced with aggregate materials where necessary to provide a stable road surface, support anticipated traffic, reduce fugitive dust, and prevent erosion. Culvert outlets should be rip-rapped to dissipate water energy at the outlet and reduce erosion.

- Road use should be restricted during the wet season if road surfacing is not adequate to prevent soil displacement, rutting, etc., and resultant stream sedimentation.

2.4 Water Resources

- In coordination with State regulatory agencies the operator will comply with all state and federal surface and ground water rules and regulations for all phases of geothermal exploration, development, operation and reclamation.

- Operators will develop a storm water management plan for the site to ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion.

- Operators will gain a clear understanding of the local hydrogeology. Areas of groundwater discharge and recharge and their potential relationships with surface water bodies will be identified.

- Operators will avoid creating hydrologic conduits between discrete aquifers during drilling, foundation excavation and other activities.

- Freshwater-bearing and other usable water aquifers will be protected from contamination by assuring all well casing (excluding the liner) is required to be cemented from the casing shoe to the surface.

- Periodic testing and monitoring via observation wells will be conducted in a manner to assure maximum protection of water resources from groundwater extraction, geothermal fluids or alterations in reservoir pressure.
- Water use will be minimized and water required for exploration and development will be obtained in a manner to assure maximum protection of water resources.
- The discharge of fill or dredged materials into waters of the United States, including wetlands, would be avoided to the greatest extent possible. Playa lakes and other wetlands provide important groundwater recharge functions in the Rose Valley.
- Avoid development of impervious geothermal facilities and access roads on the alluvial fans draining the Sierra Nevada and Coso Range. Alluvial fans provide important groundwater recharge functions in the Rose Valley.
- To the extent possible, span or avoid development in intermittent and ephemeral drainages. Construct roads perpendicular to stream crossings and avoid paralleling streams.
- To the extent possible, avoid development of geothermal facilities and access roads in the 100-year floodplain located in the low lying areas of the Rose Valley. The floodplain overlies the playa lakes that should also be avoided.
- 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 one 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.

2.5 Vegetation

- The construction crews and contractors shall be responsible for working around all shrubs and trees within the construction zone to the extent feasible. Particular avoidance shall be applied to riparian trees (i.e., cottonwoods and willows). Shrubs and trees shall be flagged by a qualified botanist or arborist to indicate top priority for avoidance.

- Operators will develop a plan for control of noxious weeds and invasive species, which could occur as a result of new surface disturbance activities at the site. The most recent recommendations at the state and local level should be incorporated into any operating plan for the geothermal exploration and development. The plan will address monitoring, education of personnel on weed identification, the manner in which weeds spread, and methods for treating infestations. The use of certified weed-free mulching will be required. If trucks and construction equipment are arriving from locations with known invasive vegetation problems, a controlled inspection and cleaning area will be established to visually inspect construction equipment arriving at the project area and to remove and collect seeds that may be adhering to tires and other equipment surfaces.

- The use of certified, weed-free mulch will be required when stabilizing areas of disturbed soil.

- All vehicles and equipment associated with ground disturbance must be washed upon entry and exit of all project sites. Washing shall include wheels, undercarriages, bumpers, and all exposed surface parts of the vehicle capable of transporting seed. All tools such as chainsaws, hand clippers, pruners, etc. must also be cleaned before and after entering all project sites. When vehicles and equipment are washed, a daily log must record the following: 1) Location; 2) Date and time; 3) Methods used; 4) Staff present; 5) Equipment washed; and 6) Signature of responsible crew member. The written logs will be turned in to the BLM botanist upon completion of the project. Interim reports must be provided if requested or if the project extends beyond the planned period.

- Fill materials and road surfacing materials that originate from areas with known invasive vegetation problems will not be used.

- Revegetation, habitat restoration and weed control activities will be initiated as soon as possible after construction activities are completed.

- Herbicides shall be applied in accordance with state and federal law. No herbicides shall be used where Threatened or Endangered species occur. No herbicides shall be sprayed when wind velocities are above five miles per hour. No herbicides shall be used on native vegetation unless specifically authorized, in writing, by the BLM.

2.6 Fish and Wildlife

- The operator will prepare a habitat restoration plan to avoid (if possible), minimize, or mitigate negative impacts on vulnerable wildlife while maintaining or enhancing habitat values for other species. The plan will identify revegetation, soil stabilization, and erosion reduction measures that will be implemented to ensure that all temporary use areas are restored. The plan will require that restoration occur as soon as possible after completion of activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats. The Restoration and Revegetation Plan shall be submitted to the lead agencies for prior approval. All project activities must comply with the approved Restoration and Revegetation Plan.

- If work during the breeding/nesting season (February 15 through August 15) cannot be avoided, then prior to construction activities, a qualified biologist shall survey all breeding/nesting habitat. If vegetation is removed during March 15 through September 15, then pre-disturbance surveys will be conducted to determine whether active nests are present within the disturbance area. Nest surveys shall be conducted no more than three days prior to the start of construction activities. Documentation of findings, including a negative finding must be submitted to the California Department of Fish and Game (CDFG) prior to construction activities for review and concurrence. If no breeding/nesting birds are observed and concurrence has been received from CDFG, site preparation and activities may begin. If an active nest is discovered or breeding activities are located and concurrence has been received from the CDFG, the breeding habitat/nest site shall be fenced a minimum of 200 feet (500 feet for raptors, ½ mile for eagles) in all directions, and this area shall not be disturbed until the nest becomes inactive, the young have fledged, the young are no longer being fed by the parents, the young have left the area, and the young will no longer be impacted by the project. This buffer may be adjusted due to environmental factors or species specific requirements upon consultation with the CDFG, BLM and/or the U.S. Fish and Wildlife Service (USFWS).

- Prior to any construction activities and tree removal during the raptor nesting season, January 31st to September 1st, a qualified biologist shall conduct a single site survey for active nests no more than one week prior to any scheduled development. If an active nest is located, then no work shall be conducted within a 500 foot radius from the nest until the young have fledged and are independent of the adults. If an inactive raptor nest is observed within the vegetation at any construction sites proposed for vegetation removal, the CDFG shall be contacted to discuss mitigation measures should the nest become active during the project term.

- The operator will conduct surveys for plant and animal species that are listed or proposed for listing as threatened or endangered and their habitats in areas proposed for development where these species could potentially occur, following accepted protocols and in consultation with the USFWS and the CDFG as appropriate. Particular care should be taken to avoid disturbing listed species during surveys in any designated critical habitat. The operator will monitor activities and their effects on ESA-listed species throughout the duration of the project.

- The operator will identify important, sensitive, or unique habitat and biota in the project vicinity and site and should design the project to avoid (if possible), minimize, or mitigate potential impacts on these resources. The design and siting of the facilities will follow appropriate guidance and requirements from the BLM, and other resource agencies, as available and applicable.

- If pesticides are used on the site, an integrated pest management plan will be developed to ensure that applications would be conducted within the framework of all Federal, State, and local laws and regulations and entail only the use of EPA-registered pesticides.

- The operator will ensure that employees, contractors, and site visitors avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons. In addition, pets will be controlled or excluded to avoid harassment and disturbance of wildlife.

- Ponds, tanks and impoundments (including but not limited to drill pits) containing liquids can present hazards to wildlife. Any liquids contaminated by substances which may be harmful due to toxicity, or fouling of the fur or feathers (detergents, oils), should be excluded from wildlife access by fencing, netting or covering at all times when not in active use. Liquids at excessive temperature should likewise be excluded. If exclusion is not feasible, such as a large pond, a hazing program based on radar or visual detection, in conjunction with formal monitoring, should be implemented. Clean water impoundments can also present a trapping hazard if they are steep-sided or lined with smooth material. All pits, ponds and tanks should have escape ramps functional at any reasonably anticipated water level, down to almost empty. Escape ramps can take various forms depending on the configuration of the impoundment. Earthen pits may be constructed with one side sloped 3:1 or greater lined ponds can use textured material; straight-sided tanks can be fitted with expanded metal escape ladders.

- In order to minimize risks of direct drainage into riparian areas or other sensitive habitats, equipment storage, fueling, and staging areas shall be located at upland areas at sufficient distance and in such a manner as to prevent runoff from entering sensitive habitat. Project related spills shall be reported to BLM/CDFG/USFWS or other appropriate agency, cleaned up immediately, and contaminated soils removed to approved disposal areas.

- If excavations are to be left open and unattended for more than 12 hours, an escape ramp will be constructed to the bottom of the pit with less than a 3:1 or greater slope to provide a means of escape for wildlife. Prior to commencement of work activity each day, staff will check any excavated pits for wildlife. All excavations to be backfilled must be inspected for wildlife immediately prior to backfilling.

- Project personnel will be restricted to the approved project limits. The project will not allow pets or hunting, killing, or harassment of native wildlife. The project will shield lighting and restrict dusk to dawn work activity that could affect diurnal and nocturnal foraging by native wildlife. Construction area and disturbance to soil and vegetation will be restricted to the minimum area possible to avoid unnecessary adverse impacts to wildlife habitat and native vegetation.

- Biological monitors will be present during project construction activities if sensitive biological resources within the area of potential impact would be adversely impacted. The monitors will be responsible for ensuring that impacts to special-status species, native vegetation, wildlife habitat, or unique resources will be avoided to the fullest extent possible. Where appropriate, monitors will flag the boundaries of areas where activities need to be restricted in order to protect native plants and wildlife or special-status species. Those restricted areas will be monitored to ensure their protection during construction.

- Construction crews will avoid impacting streambeds and banks of streams along the route to the extent possible. If necessary, a Streambed Alteration Agreement (SAA) will be secured from CDFG. Impacts will be mitigated based on the terms of the SAA.

- 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.

2.7 Cultural Resources

- Before any specific permits are issued under leases, treatment of cultural resources will follow the procedures established by the Advisory Council on Historic Preservation for compliance with Section 106 of the National Historic Preservation Act. All fieldwork will be performed under a Cultural Resource Use Permit issued by the BLM. A pedestrian inventory will 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 (NRHP). Those sites not already evaluated for NRHP eligibility will be evaluated based on surface remains, subsurface testing, archival data, and/or ethnographic sources. Archaeological survey and subsurface investigations will be monitored by tribal representatives, if requested. Subsurface testing will 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 will be submitted to the BLM. The BLM will make determinations of eligibility and effect and consult with the State Historic Preservation Offices (SHPO) as necessary based on each proposed lease application and project plans. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized or mitigated. Avoidance of impacts through project design will 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. Any data recovery will be preceded by approval of a detailed research design, Native American Consultation, and other requirements for BLM issuance of a cultural resource use permit under the Federal Land Policy and Management Act (FLPMA).

- If an area exhibits a high potential for containing cultural resources, but no artifacts were observed during an archaeological survey, monitoring by a qualified archaeologist could be required during all excavation and earthmoving in the high-potential area.

- Based on the results of survey and other investigations, the BLM may require a Cultural Resource Management Plan (CRMP) that details site-specific mitigation activities. The CRMP also will: 1) establish a monitoring program; 2) identify measures to prevent potential looting/vandalism or erosion impacts; and 3) address the education of workers and the public to make them aware of the consequences of unauthorized collection of artifacts and destruction of property on public land.

- Unexpected discovery of cultural or paleontological resources during construction will be brought to the attention of the responsible BLM authorized officer immediately. Work will be halted in the vicinity of the find to avoid further disturbance to the resources while they are being evaluated and appropriate mitigation measures are being developed.

2.8 Native American Issues and Concerns

- If requested, the applicant (BLM in their circumstance) will make presentations to interested Native American groups regarding the applicant's proposed project.

- Sacred sites or other locations of religious concern identified by Native Americans will be avoided by all project-related activities.

- Native American groups will be offered the opportunity to provide construction monitors.

- With due regard to human health and safety, the applicant will work to minimize the need to limit access to locations by Native Americans.

- Unexpected discovery of Native American cultural resources during construction will be brought to the attention of the responsible BLM authorized officer immediately, who will inform Native American tribal representatives. Work will be halted in the vicinity of the find to avoid further disturbance to the resources while they are being evaluated and appropriate mitigation measures are being developed. Under no circumstances will human skeletal remains, if discovered, be disturbed or altered and all work in the vicinity will halt until appropriate actions have been completed by Tribal representatives.

2.9 Paleontological Resources

- Operators will determine whether paleontological resources exist in a project area on the basis of the sedimentary context of the area, a records search for past paleontological finds in the area, and/or, depending on the extent of existing information, a paleontological survey.

- If paleontological resources are present at the site, or if areas with a high potential to contain paleontological material have been identified, a paleontological resources management plan will be developed. This plan will include a mitigation plan for avoidance, removal of fossils, or monitoring. If an area exhibits a high potential but no fossils were observed during survey, monitoring by a qualified paleontologist may be required during excavation and earthmoving in the sensitive area. The operator will submit a report to the agency documenting these activities. The paleontological resources management plan also will: 1) establish a monitoring program; 2) identify measures to prevent potential looting/vandalism or erosion impacts; and 3) address the education of workers and the public to make them aware of the consequences of unauthorized collection of fossils on public land.

- Unexpected discovery of paleontological resources during construction will be brought to the attention of the responsible BLM authorized officer immediately. Work will be halted in the vicinity of the find to avoid further disturbance to the resources while they are being evaluated and appropriate mitigation measures are being developed.

2.10 Visual

- The operator will incorporate visual design considerations into the planning and design of the project to minimize potential visual impacts of the proposal and to meet the Visual Resource Management objectives of the area and the agency.
- "Dulled" or galvanized metal finish towers or poles shall be used for transmission lines to reduce visual contrast.
- Non-specular (non-reflective) conductors shall be used for transmission lines to reduce visual contrast.
- Construct low-profile structures whenever possible to reduce structure visibility.
- Select and design materials and surface treatments to repeat or blend with landscape elements.
- Site projects outside of the viewsheds of publically accessible vantage points, or if this cannot be avoided, as far away as possible.
- Site projects to take advantage of both topography and vegetation as screening devices to restrict views of projects from visually sensitive areas.
- Site facilities away from and not adjacent to prominent landscape features (e.g., foothills or mountains, and water features).
- Avoid placing facilities on ridgelines, summits, or other locations such that they will be silhouetted against the sky from visually sensitive areas.
- Collocate facilities to the extent possible to use existing and shared rights-of-way, existing and shared access and maintenance roads, and other infrastructure to reduce visual contrast.
- Site linear features (aboveground pipelines, rights-of-way, and roads) to follow natural land contours rather than straight lines (particularly up slopes) when possible. Fall-line cuts should be avoided.
- Site linear features to cross other linear features (e.g., trails, roads) at right angles whenever possible to minimize viewing area and duration.
- Site and design structures and roads to minimize and balance cuts and fills and to preserve existing rocks, vegetation, and drainage patterns to the maximum extent possible.
- Use appropriately colored materials for structures or appropriate stains and coatings to blend with the project's backdrop. Refer to the Standard Environmental Colors chart available from the BLM.
- Use non-reflective or low-reflectivity materials, coatings, or paints whenever possible.

- Site pipelines adjacent to roadways to reduce surface disturbance and minimize visual contrast.
- No paint or permanent discoloring agents shall be applied to rocks or vegetation to indicate survey or construction activity limits.
- Paint grouped structures the same color to reduce visual complexity and color contrast.
- Design and install efficient facility lighting so that the minimum amount of lighting required for safety and security is provided but not exceeded and so that upward light scattering (light pollution) is minimized. This may include, for example, installing shrouds to minimize light from straying off-site, properly directing light to only illuminate necessary areas, and installing motion sensors to only illuminate areas when necessary to reduce offsite visual contrast during nighttime hours.
- Site construction staging areas and laydown areas outside of the viewsheds of publically accessible vantage points and visually sensitive areas, where possible, including siting in swales, around bends, and behind ridges and vegetative screens.
- Discuss visual impact mitigation objectives and activities with equipment operators prior to commencement of construction activities.
- Avoid installing gravel and pavement where possible to reduce color and texture contrasts with existing landscape.
- Use excess fill to fill uphill-side swales resulting from road construction in order to reduce unnatural-appearing slope interruption and to reduce fill piles.
- Avoid downslope wasting of excess fill material.
- Round road-cut slopes, vary cut and fill pitch to reduce contrasts in form and line, and vary slope to preserve specimen trees and nonhazardous rock outcroppings.
- Provide benches in rock cuts to accent natural strata.
- Use split-face rock blasting to minimize unnatural form and texture resulting from blasting.
- Segregate topsoil from cut and fill activities and spread it on freshly disturbed areas to reduce color contrast and to aid rapid revegetation.
- Bury utility cables in or adjacent to the road where feasible.
- Undertake interim restoration during the operating life of the project as soon as possible after disturbances. During road maintenance activities, avoid blading existing forbs and grasses in ditches and along roads.

- Randomly scarify cut slopes to reduce texture contrast with existing landscape and to aid in revegetation.

- Cover disturbed areas with stockpiled topsoil or mulch, and revegetate with a mix of native species establishing a composition consistent with the form, line, color, and texture of the surrounding undisturbed landscape."

- Restore rocks, brush, and natural debris whenever possible to approximate preexisting visual conditions.

2.11 Health and Safety

- Operators will develop a hazardous materials management plan addressing storage, use, transportation, and disposal of each hazardous material anticipated to be used at the site. The plan will identify all hazardous materials that would be used, stored, or transported at the site. It will establish inspection procedures, storage requirements, storage quantity limits, inventory control, nonhazardous product substitutes, and disposition of excess materials. The plan will also identify requirements for notices to federal and local emergency response authorities and include emergency response plans.

- Operators will develop a waste management plan identifying the waste streams that are expected to be generated at the site and addressing hazardous waste determination procedures, waste storage locations, waste-specific management and disposal requirements, inspection procedures, and waste minimization procedures. This plan will address all solid and liquid wastes that may be generated at the site.

- Operators will develop a spill prevention and response plan identifying where hazardous materials and wastes are stored on site, spill prevention measures to be implemented, training requirements, appropriate spill response actions for each material or waste, the locations of spill response kits on site, a procedure for ensuring that the spill response kits are adequately stocked at all times, and procedures for making timely notifications to authorities.

- A safety assessment will be conducted to describe potential safety issues and the means that would be taken to mitigate them, including issues such as site access, construction, safe work practices, security, heavy equipment transportation, traffic management, emergency procedures, and fire control.

- A health and safety program will be developed to protect both workers and the general public during construction and operation of geothermal projects.

- Regarding occupational health and safety, the program will identify all applicable federal and state occupational safety standards; establish safe work practices for each task (e.g., requirements for personal protective equipment and safety harnesses; Occupational Safety and Health Administration standard practices for safe use of explosives and blasting agents; and measures for reducing occupational electric and magnetic fields exposures); establish fire safety evacuation procedures; and define safety performance standards (e.g., electrical system standards and lightning protection standards). The program will include a training program to identify hazard training requirements for workers for each task and establish procedures for providing required training to all workers. Documentation of training and a mechanism for reporting serious accidents to appropriate agencies will be established.

- Regarding public health and safety, the health and safety program will establish a safety zone or setback for generators from residences and occupied buildings, roads, right-of-ways, and other public access areas that is sufficient to prevent accidents resulting from the operation of generators. It will identify requirements for temporary fencing around staging areas, storage yards, and excavations during construction or rehabilitation activities. It will also identify measures to be taken during the operation phase to limit public access to hazardous facilities (e.g., permanent fencing would be installed only around electrical substations, and facility access doors would be locked).

- Operators will consult with local planning authorities regarding increased traffic during the construction phase, including an assessment of the number of vehicles per day, their size, and type. Specific issues of concern (e.g., location of school bus routes and stops) will be identified and addressed in the traffic management plan.

- Operators will develop a fire management strategy to implement measures to minimize the potential for a human-caused fire.

- Underground utilities will be installed to minimize the amount of open trenches at any given time, keeping trenching and backfilling crews close together. Avoid leaving trenches open overnight. Where trenches cannot be back-filled immediately, escape ramps should be constructed at least every 100 feet.

2.12 Wild Horses and Burros

- The operator will ensure employees, contractors, and site visitors avoid harassment and disturbance of wild horses and burros, especially during reproductive (e.g., breeding and birthing) seasons. In addition, any pets will be controlled to avoid harassment and disturbance of wild horses and burros.

- Observations of potential problems regarding wild horses or burros, including animal mortality, will be immediately reported to the agency.

2.13 Livestock Grazing

- The operator will coordinate with livestock operators to minimize impacts to livestock operations.

2.14 Recreation

- Any necessary temporary route closures for construction would be coordinated with BLM and 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. 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 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 recreation use periods.

2.15 Scenic and Historic Trails

- When any right-of-way application includes remnants of a scenic or historic trail, is located within the viewshed of an historic trail's designated centerline, or includes or is within the viewshed of a trail eligible for listing on the NRHP, the operator will evaluate the potential visual impacts to the trail associated with the proposed project and identify appropriate mitigation measures for inclusion in the operation plan.

2.16 Transportation/Roads/Pads

- Operators will consult with local planning authorities regarding increased traffic prior to the construction phase, including an assessment of the number of vehicles per day, their size, and type. Specific issues of concern (e.g., location of school bus routes and stops) will be identified and addressed in the traffic management plan.

- Traffic will be restricted to the roads developed for the project. Use of other unimproved roads will be restricted to emergency situations.

- Signs will be placed along roads to identify speed limits, travel restrictions, and other standard traffic control information. Signs directing vehicles to alternative park access and parking will be posted in the event construction temporarily obstructs recreational parking areas near trailheads. Whenever active work is being performed, the area will be posted with "construction ahead" signs on any adjacent access roads or trails that might be affected.

- Project personnel and contractors will be instructed and required to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions, to ensure safe and efficient traffic flow and to reduce wildlife collisions and disturbance and fugitive dust.

- When practical, construction activities will be avoided during high recreational use periods.

- To plan for efficient use of the land, necessary infrastructure will be consolidated wherever possible.

- Existing roads and pad sites will be used to the maximum extent feasible, but only if located in a safe and environmentally sound location. No new roads and pad sites will be constructed without agency authorization. If new roads and pad sites have been authorized, they will be designed and constructed by the operator to the appropriate agency standard, no higher than necessary to accommodate their intended function. Roads and pad sites will be routinely maintained by the operator to assure public safety and to minimize impacts to the environment such as erosion, sedimentation, fugitive dust, and loss of vegetation.

- An access road siting and management plan will be prepared incorporating existing Agency standards regarding road design, construction, and maintenance such as those described in the BLM 9113 Manual and the Surface Operating Standards for Oil and Gas Exploration and Development (i.e., the Gold Book, 4th Edition, 2007).

- A traffic management plan will be prepared for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan will incorporate measures such as informational signs, flaggers when equipment may result in blocked throughways, and traffic cones to identify any necessary changes in temporary lane configuration.

- Where possible, access roads will be located to follow natural contours and minimize side hill cuts and fills. Excessive grades on roads, road embankments, ditches, and drainages will be avoided, especially in areas with erodible soils.

- Roads will be designed so that changes to surface water runoff are minimized and new erosion is not initiated.

- Access roads will be located to minimize stream crossings. All structures crossing streams will be located and constructed so that they do not decrease channel stability or increase water velocity. Operators will obtain all applicable federal and state water crossing permits.

- Roads will be located away from drainage bottoms and avoid wetlands, if practicable.

- The operator will obtain agency authorization prior to borrowing soil or rock material from agency lands.

- Road use will be restricted during the wet season if road surfacing is not adequate to prevent soil displacement, rutting, etc., and resultant stream sedimentation.

- Access roads and on-site roads will be surfaced with aggregate materials where necessary to provide a stable road surface, support anticipated traffic, reduce fugitive dust, and prevent erosion.

- Dust abatement techniques will be used before and during surface clearing, excavation, or blasting activities. Dust abatement techniques will be used on unpaved, unvegetated surfaces to minimize fugitive dust. Speed limits (e.g., 25 mph) will be posted and enforced to reduce fugitive dust. Construction materials and stockpiled soils will be covered if they are a source of fugitive dust.

- Culvert outlets will be rip-rapped to dissipate water energy at the outlet and reduce erosion. Catch basins, roadway ditches, and culverts will be cleaned and maintained regularly.

2.17 Waste Management

- All refueling will occur in a designated fueling area that includes a temporary berm to limit the spread of any spill.
- Drip pans will be used during refueling to contain accidental releases.
- Drip pans will be used under fuel pump and valve mechanisms of any bulk fueling vehicles parked at the construction site.
- Any containers used to collect liquids will be enclosed or screened to prevent access to contaminants by wildlife, livestock, and migratory birds.
- Spills will be immediately addressed per the spill management plan, and soil cleanup and removal initiated as soon as feasible.

2.18 Pipelines

- Pipelines constructed above ground due to thermal gradient induced expansion and contraction will rest on cradles above ground level, allowing small animals to pass underneath. Projects should be analyzed to ensure adequate passage for all wildlife species. The pipeline will be raised higher to allow wildlife passage where needed. Because pipeline corridors through certain habitat types can alter local predator-prey dynamics by providing predators with lines of sight and travel corridors, large projects should be analyzed to ensure there will be no significant changes to predator-prey balance.

3.0 RECLAMATION PERFORMANCE STANDARDS

The following reclamation performance standards will be met:

3.1 Interim Reclamation

This includes disturbed areas that may be redisturbed during operations and will be redisturbed at final reclamation to achieve restoration of the original landform and a natural vegetative community.

- Disturbed areas not needed for active, long-term production operations or vehicle travel have been recontoured, protected from erosion, and revegetated with a self-sustaining, vigorous, diverse, native (or as otherwise approved) plant community sufficient to minimize visual impacts, provide forage, stabilize soils, and impede the invasion of noxious, invasive, and non-native weeds.

3.2 Final Reclamation

Includes disturbed areas where the original landform and a natural vegetative community have been restored.

- The original landform has been restored for all disturbed areas including well pads, production facilities, roads, pipelines, and utility corridors.

- General: A self-sustaining, vigorous, diverse, native (or otherwise approved) plant community is established on the site, with a density sufficient to control erosion and invasion by non-native plants and to reestablish wildlife habitat or forage production. At a minimum, the established plant community will consist of species included in the seed mix and/or desirable species occurring in the surrounding natural vegetation.

- Specific: No single species will account for more than 30% total vegetative composition unless it is evident at higher levels in the adjacent landscape. Permanent vegetative cover will be determined successful when the basal cover of desirable perennial species is at least 80% of the basal cover on adjacent or nearby undisturbed areas where vegetation is in a healthy condition; or 80% of the potential basal cover as defined in the National Resource Conservation Service Ecological Site(s) for the area. Plants must be resilient as evidenced by well-developed root systems and flowers. [Shrubs, will be well established and in a "young" age class at a minimum (therefore, not comprised mainly of seedlings that may not survive until the following year).]

- In agricultural areas, irrigation systems and soil conditions are reestablished in such a way as to ensure successful cultivation and harvesting of crops.

- Erosion features are equal to or less than surrounding area and erosion control is sufficient so that water naturally infiltrates into the soil and gullying, headcutting, slumping, and deep or excessive rills (greater than three inches) are not observed.

- The site is free of State- or county-listed noxious weeds, oil field debris and equipment, and contaminated soil. Invasive and non-native weeds are controlled.

3.3 Reclamation Actions

- During initial well pad, production facility, road, pipeline, and utility corridor construction and prior to completion of the final well on the well pad, pre-interim reclamation stormwater management actions will be taken to ensure disturbed areas are quickly stabilized to control surface water flow and to protect both the disturbed and adjacent areas from erosion and siltation. This may involve construction and maintenance of temporary silt ponds, silt fences, berms, ditches, and mulching.

- When the last well on the pad has been completed, some portions of the well location will undergo interim reclamation and some portions of the well pad will usually undergo final reclamation. Most well locations will have limited areas of bare ground, such as a small area around production facilities or the surface of a rocked road. Other areas will have interim reclamation where workover rigs and fracturing tanks may need a level area to set up in the future. Some areas will undergo final reclamation where portions of the well pad will no longer be needed for production operations and can be recontoured to restore the original landform.

- The following minimum reclamation actions will be taken to ensure that the reclamation objectives and standards are met. It may be necessary to take additional reclamation actions beyond the minimum in order to achieve the Reclamation Standards.

3.4 Reclamation - General

Procedure:

- The agency will be notified 24 hours prior to commencement of any reclamation operations.

Site Maintenance and Hygiene:

- Immediately upon well completion, the well location and surrounding areas(s) will be cleared of, and maintained free of, all debris, materials, trash, and equipment not required for production.

- No hazardous substances, trash, or litter will be buried or placed in pits. Upon well completion, any hydrocarbons in the pit will be remediated or removed.

- All trash generated from this project will be collected and disposed of off BLM administered lands at an approved disposal site. The project site shall be kept clean of debris and microtrash to avoid attracting wildlife. All food-related trash items shall be enclosed in sealed containers and regularly removed from the site.

Vegetation Clearing:

- Vegetation removal and the degree of surface disturbance will be minimized wherever possible.

- Temporary impacts shall be returned to pre-existing contours and revegetated with a BLM approved native plant species mix. Special Status vegetation will be flagged and voided when necessary.

- [Example of site-specific requirement: During vegetation clearing activities, trees and woody vegetation removed from the well pad and access road will be moved aside prior to any soil disturbing activities. Care will be taken to avoid mixing soil with the trees and woody vegetation. Trees left for wood gathering will be cut [twelve inches or less from the ground], delimbed, and the trunks, six inches or more in diameter will be removed and placed either by the uphill side of the access road, or moved to the end of the road, or to a road junction for easy access for wood gatherers and to reduce vehicle traffic on the well pad. Trees with a trunk diameter less than six inches and woody vegetation will be used to trap sediment, slow runoff, or scattered on reclaimed areas to stabilize slopes, control erosion, and improve visual resources.]

Topsoil Management:

- Operations will disturb the minimum amount of surface area necessary to conduct safe and efficient operations. When possible, equipment will be stored and operated on top of vegetated ground to minimize surface disturbance.

- In areas to be heavily disturbed, the top eight inches of soil material, will be stripped and stockpiled around the perimeter of the well location to control run-on and run-off, and to make redistribution of topsoil more efficient during interim reclamation. Stockpiled topsoil may include vegetative material. Topsoil will be clearly segregated and stored separately from subsoils.

- Earthwork for interim and final reclamation will be completed within six months of well completion or plugging unless a delay is approved in writing by the BLM authorized officer.

- Salvaging and spreading topsoil will not be performed when the ground or topsoil is frozen or too wet to adequately support construction equipment. If such equipment creates ruts in excess of four inches deep, the soil will be deemed too wet.

- No major depressions will be left that would trap water and cause ponding.

- Water pipelines should be inspected daily to eliminate the potential for soil erosion caused by leaking or broken pipes.

- In agricultural areas, irrigation systems and soil conditions should be reestablished in such a way as to ensure successful cultivation and harvesting of crops.

Seeding:

- Seedbed Preparation. Initial seedbed preparation will consist of recontouring to the appropriate interim or final reclamation standard. All compacted areas to be seeded will be ripped to a minimum depth of 18 inches with a minimum furrow spacing of two feet, followed by recontouring the surface and then evenly spreading the stockpiled topsoil. Prior to seeding, the seedbed will be scarified and left with a rough surface.

  If broadcast seeding is to be used and is delayed, final seedbed preparation will consist of contour cultivating to a depth of 4 to 6 inches within 24 hours prior to seeding, dozer tracking, or other imprinting in order to loosen up the soil and create seed germination micro-sites.

- Seed Application. Seeding will be conducted no more than 24 hours following completion of final seedbed preparation. A certified weed-free seed mix designed by the BLM to meet reclamation standards will be used.

No seeding will occur from [May 15 to September 15]. Fall seeding is preferred and will be conducted after [September 15] and prior to ground freezing. [Shrub species will be seeded separately and will be seeded during the winter.] Spring seeding will be conducted after the frost leaves the ground and no later than [May 15].

Erosion Control and Mulching:

- Mulch, silt fencing, waddles, hay bales, and other erosion control devices will be used on areas at risk of soil movement from wind and water erosion.

- Mulch will be used if necessary to control erosion, create vegetation micro-sites, and retain soil moisture and may include hay, small-grain straw, wood fiber, live mulch, cotton, jute, or synthetic netting. Mulch will be free from mold, fungi, and certified free of noxious or invasive weed seeds.

- If straw mulch is used, it will contain fibers long enough to facilitate crimping and provide the greatest cover.

Pit Closure:

- Reserve pits will be closed and backfilled within 60 days of release of the rig. All reserve pits remaining open after 60 days will require written authorization of the authorized officer. Immediately upon well completion, any hydrocarbons or trash in the pit will be removed. Pits will be allowed to dry, be pumped dry or solidified in-situ prior to backfilling.

- Following completion activities, pit liners will be completely removed or removed down to the solids level and disposed of at an approved landfill, or treated to prevent their reemergence to the surface and interference with long-term successful revegetation. If it was necessary to line the pit with a synthetic liner, the pit will not be trenched (cut) or filled (squeezed) while containing fluids. When dry, the pit will be backfilled with a minimum of five feet of soil material. In relatively flat areas the pit area will be slightly mounded above the surrounding grade to allow for settling and to promote surface drainage away from the backfilled pit.

Management of Invasive, Noxious, and Non-Native Species:

- All reclamation equipment will be cleaned prior to use to reduce the potential for introduction of noxious weeds or other undesirable non-native species.

- An intensive weed monitoring and control program will be implemented prior to site preparation for planting and will continue until interim or final reclamation is approved by the authorized officer.

- Monitoring will be conducted at least annually during the growing season to determine the presence of any invasive, noxious, and non-native species. Invasive, noxious, and non-native species that have been identified during monitoring will be promptly treated and controlled. A Pesticide Use Proposal will be submitted to the BLM for approval prior to the use of herbicides.

3.5 Interim Reclamation Procedures – Additional

Recontouring:

- Interim reclamation actions will be completed no later than six months from when the final well on the location has been completed, weather permitting. The portions of the cleared well site not needed for active operational and safety purposes will be recontoured to the original contour if feasible, or if not feasible, to an interim contour that blends with the surrounding topography as much as possible. Sufficient semi-level area will remain for setup of a workover rig and to park equipment. In some cases, rig anchors may need to be pulled and reset after recontouring to allow for maximum interim reclamation.

- If the well is a producer, the interim cut and fill slopes prior to re-seeding will not be steeper than a 3:1 ratio, unless the adjacent native topography is steeper. Note: Constructed slopes may be much steeper during drilling, but will be recontoured to the above ratios during interim reclamation.

- Roads and well production equipment will be placed on location so as to permit maximum interim reclamation of disturbed areas. If equipment is found to interfere with the proper interim reclamation of disturbed areas, the equipment will be moved so proper recontouring and revegetation can occur.

Application of Topsoil & Revegetation:

- Topsoil will be evenly respread and aggressively revegetated over the entire disturbed area not needed for all-weather operations including road cuts & fills and to within a few feet of the production facilities, unless an all-weather, surfaced, access route or small "teardrop" turnaround is needed on the well pad.

- In order to inspect and operate the well or complete workover operations, it may be necessary to drive, park, and operate equipment on restored, interim vegetation within the previously disturbed area. Damage to soils and interim vegetation will be repaired and reclaimed following use. To prevent soil compaction, under some situations, such as the presence of moist, clay soils, the vegetation and topsoil will be removed prior to workover operations and restored and reclaimed following workover operations.

Visual Resources Mitigation for Reclamation:

- Trees, if present, and vegetation will be left along the edges of the pads whenever feasible to provide screening.

- To help mitigate the contrast of recontoured slopes, reclamation will include measures to feather cleared lines of vegetation and to save and redistribute cleared trees, debris, and rock over recontoured cut and fill slopes.

- To reduce the view of production facilities from visibility corridors and private residences, facilities will not be placed in visually exposed locations (such as ridgelines and hilltops).
- Production facilities will be clustered and placed away from cut slopes and fill slopes to allow the maximum recontouring of the cut and fill slopes.
- All long-term above ground structures will be painted [Dead Brown] (from the "Standard Environmental Colors" chart) to blend with the natural color of the late summer landscape background.

3.6 Final Reclamation Procedures - Additional

- Final reclamation actions will be completed within six months of well plugging, weather permitting.
- All disturbed areas, including roads, pipelines, pads, production facilities, and interim reclaimed areas will be recontoured to the contour existing prior to initial construction or a contour that blends indistinguishably with the surrounding landscape. Salvaged topsoil will be respread evenly over the entire disturbed site to ensure successful revegetation. To help mitigate the contrast of recontoured slopes, reclamation will include measures to feather cleared lines of vegetation and to save and redistribute cleared trees, woody debris, and large rocks over recontoured cut and fill slopes.
- Water breaks and terracing will only be installed when absolutely necessary to prevent erosion of fill material. Water breaks and terracing are not permanent features and will be removed and reseeded when the rest of the site is successfully revegetated and stabilized.
- If necessary to ensure timely revegetation, the pad will be fenced to BLM standards to exclude livestock grazing for the first two growing seasons or until seeded species become firmly established, whichever comes later. Fencing will meet standards found on page 18 of the BLM/FS Gold Book, 4th Edition, or will be fenced with operational electric fencing.
- Final abandonment of pipelines and flowlines will involve flushing and properly disposing of any fluids in the lines. All surface lines and any lines that are buried close to the surface that may become exposed in the foreseeable future due to water or wind erosion, soil movement, or anticipated subsequent use, must be removed. Deeply buried lines may remain in place unless otherwise directed by the authorized officer.

3.7 Reclamation Monitoring and Final Abandonment Approval

- Reclaimed areas will be monitored annually. Actions will be taken to ensure that reclamation standards are met as quickly as reasonably practical.
- Reclamation monitoring will be documented in an annual reclamation report submitted to the authorized officer by [March 1]. The report will document compliance with all aspects of the reclamation objectives and standards, identify whether the reclamation objectives and standards are likely to be achieved in the near future without additional actions, and identify actions that have been or will be taken to meet the objectives and standards. The report will

also include acreage figures for: Initial Disturbed Acres; Successful Interim Reclaimed Acres; and Successful Final Reclaimed Acres. Annual reports will not be submitted for sites approved by the authorized officer in writing as having met interim or final reclamation standards. Monitoring and reporting continues annually until interim or final reclamation is approved. Any time 30% or more of a reclaimed area is redisturbed, monitoring will be reinitiated.

- The authorized officer will be informed when reclamation has been completed, appears to be successful, and the site is ready for final inspection.

United States Department of the Interior Bureau of Land Management lease example, with terms and instructions, on the following three pages:

Form 3200-24A (September 2008)

OFFER TO LEASE AND LEASE FOR GEOTHERMAL RESOURCES

Form 3200-24a
(September 2008)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

OFFER TO LEASE AND LEASE FOR GEOTHERMAL RESOURCES
(For New Leases Issued Under the Energy Policy Act of 2005 [August 5, 2005])

Serial No.

The undersigned (see page 2) offers to lease all or any of the lands in item 2 that are available for lease pursuant to the Geothermal Steam Act of 1970, as amended (30 U.S.C. 1001-1025).

READ INSTRUCTIONS BEFORE COMPLETING

1. Name	1a. Street	
1b. City	1c. State	1d. Zip Code

2. Surface managing agency if other than BLM: ______________________ Unit/Project: ______________________

Legal description of land requested (segregate by public domain and acquired lands): Enter T., R., Meridian, State and County

Total Acres Applied for ____________

Percent U.S. interest ____________

Amount remitted: Processing Fee $ ____________ Rental Fee $ ____________ Total $ ____________

DO NOT WRITE BELOW THIS LINE

3. Land included in lease: Enter T., R., Meridian, State and County

Total Acres in Lease ____________

Rental Retained $ ____________

In accordance with the above offer, or the previously submitted competitive bid, this lease is issued granting the exclusive right to drill for, extract, produce, remove, utilize, sell and dispose of all the geothermal resources in the lands described in Item 3 together with the right to build and maintain necessary improvements thereupon, for a primary term o 10 years and subsequent extensions thereof in accordance with 43 CFR subpart 3207. Rights granted are subject to: applicable laws; the terms, conditions, and attache stipulations of this lease; the Secretary of the Interior's regulations and formal orders in effect as of lease issuance; and, when not inconsistent with the provisions of this lease regulations and formal orders hereafter promulgated.

Type of Lease:

- ☐ Competitive
- ☐ Noncompetitive
- ☐ Noncompetitive direct use (43 CFR subpart 3205)

Comments:

THE UNITED STATES OF AMERICA

BY ______________________
(Signing Official)

____
(Printed Name)

______________________ ____________
(Title) (Date)

EFFECTIVE DATE OF LEASE ____________

Check if this is a converted lease ☐

EFFECTIVE DATE OF LEASE CONVERSION ____________

(Continued on page 2)

e undersigned certifies that
The offeror is a citizen of the United States, an association of such citizens, a municipality, or a corporation organized under the laws of the United States, any State or the District of Columbia. (2) All parties holding an erest in the offer are in compliance with 43 CFR part 3200 and the authorizing Act; (3) The offeror's chargeable interests, direct and indirect, do not exceed those allowed under the Act; and (4) The offeror is not considered ninor under the laws of the State in which the lands covered by this offer are located.
e undersigned agrees that signing this offer constitutes acceptance of this lease, including all terms, conditions and stipulations of which the offeror has been given notice. The offeror further agrees that this offer cannot be hdrawn, either in whole or part, unless the withdrawal is received by the proper BLM State Office before this lease, an amendment to this lease, or a separate lease, whichever covers the land described in the withdrawal, has n signed on behalf of the United States.

---

will be rejected and will afford the offeror no priority if it is not properly completed and executed in accordance with the regulations or if it is not accompanied by the required payments. Title 18 U.S.C. § 1001 makes it a ny person knowingly and willfully to make to any Department or agency of the United States any false, fictitious, or fraudulent statements or representations as to any matter within its jurisdiction.

---

ted this ______ day of ______________________, 20____ ______________________ ______________________

(Printed Name of Lessee or Attorney-in-fact) (Signature of Lessee or Attorney-in-fact)

LEASE TERMS

tals—Rentals must be paid to the proper office of the lessor in advance of each lease year. Annual per acre or fraction thereof, as applicable, are:
npetitive lease (includes post-sale parcels not receiving bids, a direct use lease or a lease issued to aimant): $1.00 for the first 10 years; thereafter $5.00; or
itive lease: $2.00 for the first year; $3.00 for the second through tenth year; thereafter $5.00.
al is always due by the anniversary date of this lease (43 CFR 3211.13), regardless of whether the unit or outside of a unit, the lease is in production or not, or royalties or direct use fees apply to on.
only be credited toward royalty under 43 CFR 3211.15 and 30 CFR 218.303. Rental may not be inst direct use fees. Failure to pay annual rental timely will result in late fees and will make the t to termination in accordance with 43 CFR 3213.14.

Royalties—Royalties must be paid to the proper office of the lessor. Royalties are due on the last month following the month of production. Royalties will be computed in accordance with regulations and orders. Royalty rates for geothermal resources produced for the commercial of electricity but not sold in an arm's length transaction are: 1.75 percent for the first 10 years of and 3.5 percent after the first 10 years. The royalty rate is to be applied to the gross proceeds n the sale of electricity in accordance with 30 CFR part 206 subpart H.
rate for byproducts derived from geothermal resource production that are minerals specified in the Mineral Leasing Act (MLA), as amended (30 U.S.C. 181), is 5 percent, except for sodium produced between September 29, 2006 and September 29, 2011 (Pub. L. No. 109-338, §102; S.C. 362) for which the royalty rate is 2 percent. No royalty is due on byproducts that are not 30 U.S.C. § 181. (43 CFR 3211.19.)
or a portion thereof is committed to an approved communitization or unit agreement and the ontains a provision for allocation of production, royalties must be paid on the production this lease.
ngth transactions—The royalty rate for geothermal resources sold by you or your affiliate at to a purchaser is 10 percent of the gross proceeds derived from the arm's-length sale (43 CFR 1.18).
d royalties—In the absence of a suspension, if you cease production for more than one calendar ease that is subject to royalties and that has achieved commercial production, your lease will ect only if you make advanced royalty payments in accordance with 43 CFR 3212.15(a) and 30

e fees—Direct use fees must be paid in lieu of royalties for geothermal resources that are utilized ial, residential, agricultural, or other energy needs other than the commercial production or electricity, but not sold in an arm's length transaction (43 CFR 3211.18; 30 CFR 206.356). nent applies to any direct use of federal geothermal resources (unless the resource is exempted in 30 CFR 202.351(b) or the lessee is covered by paragraph (e), below) and is not limited to ses. Direct use fees are due on the last day of the month following the month of production.
ee is a State, tribal, or local government covered by 43 CFR 3211.18(a)(3) and 30 CFR k here ❑. A lessee under this paragraph is not subject to paragraph (d), above. In lieu of lessee under this paragraph must pay a nominal fee of ______________

ds—A bond must be filed and maintained for lease operations as required by applicable

k requirements, rate of development, unitization, and drainage--Lessee must perform work in accordance with applicable regulations (43 CFR 3207.11, 3207.12), and must prevent damage to, loss of, or waste of leased resources. Lessor reserves the right to specify rates of and production and to require lessee to commit to a communitization or unit agreement, within otice, if in the public interest. Lessee must drill and produce wells necessary to protect leased ainage or pay compensatory royalty for drainage in the amount determined by lessor. Lessor lessee from work requirements only where the lease overlies a mining claim that has an of operations and where BLM determines that the development of the geothermal resource on ld interfere with the mining operation (43 CFR 3207.13).

nents, evidence, and inspection—Lessee must file with the proper office of the lessor, not later s after the effective date thereof, any contract or evidence of other arrangement for the sale, use, f geothermal resources, byproducts produced, or for the sale of electricity generated using sources produced from the lease. At such times and in such form as lessor may prescribe, lessee detailed statements and all documents showing (a) amounts and quality of all geothermal luced and used (either for commercial production or generation of electricity, or in a direct use sold; (b) proceeds derived therefrom or from the sale of electricity generated using such amounts that are unavoidably lost or reinjected before use, used to generate plant parasitic defined in 30 CFR 206.351) or electricity for lease operations, or otherwise used for lease ated to the commercial production or generation of electricity; and (d) amounts and quality of produced and proceeds derived from the sale or disposition thereof. Lessee may be required to and schematic diagrams showing development work and improvements, and reports with es in interest.
d manner approved by lessor, lessee must: keep a daily drilling record, a log, and complete l well surveys and tests; keep a record of subsurface investigations; and furnish copies to lessor

l on page 3)

Lessee must keep open at all reasonable times for inspection by any authorized officer of lessor, the leased premises and all wells, improvements, machinery, and fixtures thereon, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or in the leased lands. Lessee must maintain copies of all contracts, sales agreements, accounting records, billing records, invoices, gross proceeds and payment data regarding the sale, disposition, or use of geothermal resources, byproducts produced, and the sale of electricity generated using resources produced from the lease, and all other information relevant to determining royalties or direct use fees. All such records must be maintained in lessee's accounting offices for future audit by lessor and produced upon request by lessor or lessor's authorized representative or agent. Lessee must maintain required records for 6 years after they are generated or, if an audit or investigation is underway, until released of the obligation to maintain such records by lessor.

Sec. 6. Conduct of operations—Lessee must conduct operations in a manner that minimizes adverse impacts to the land, air, and water, to cultural, biological, visual, and other resources, and to other land uses or users. Lessee must take reasonable measures deemed necessary by lessor to accomplish the intent of this section. To the extent consistent with leased rights granted, such measures may include, but are not limited to, modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures. Lessor reserves the right to continue existing uses and to authorize future uses upon or in the leased lands, including the approval of easements or rights-of-way. Such uses will be conditioned so as to prevent unnecessary or unreasonable interference with rights of lessee. Prior to disturbing the surface of the leased lands, lessee must contact lessor to be apprised of procedures to be followed and modifications or reclamation measures that may be necessary. Areas to be disturbed may require inventories or special studies to determine the extent of impacts to other resources. Lessor may require lessee to complete minor inventories or short term special studies under guidelines provided by lessor. If, in the conduct of operations, threatened or endangered species, objects of historic or scientific interest, or substantial unanticipated environmental effects are observed, lessee must immediately contact lessor. Lessee must cease any operations that are likely to affect or take such species, or result in the modification, damage or destruction of such habitats or objects.

Sec. 7. Production of byproducts—If the production, use, or conversion of geothermal resources from these leased lands is susceptible of producing a valuable byproduct or byproducts, including commercially demineralized water for beneficial uses in accordance with applicable State water laws, lessor may require substantial beneficial production or use thereof by lessee.

Sec. 8. Damages to property—Lessee must pay lessor for damage to lessor's improvements, and must save and hold lessor harmless from all claims for damage or harm to persons or property as a result of lease operations.

Sec. 9. Protection of diverse interests and equal opportunity—Lessee must maintain a safe working environment in accordance with applicable regulations and standard industry practices, and take measures necessary to protect public health and safety. Lessor reserves the right to ensure that production is sold at reasonable prices and to prevent monopoly. Lessee must comply with Executive Order No. 11246 of September 24, 1965, as amended, and regulations and relevant orders of the Secretary of Labor issued pursuant thereto. Neither lessee nor lessee's subcontractor may maintain segregated facilities.

Sec. 10. Transfer of lease interests and relinquishment of lease—As required by regulations, lessee must file with lessor any assignment or other transfer of an interest in this lease. Subject to the requirements of 43 CFR subpart 3213, lessee may relinquish this lease or any legal subdivision by filing in the proper office a written relinquishment, which will be effective as of the date BLM receives it, subject to the continued obligation of the lessee and surety to be responsible for: paying all accrued rentals and royalties; plugging and abandoning all wells on the relinquished land; restoring and reclaiming the surface and other resources; and complying with 43 CFR 3200.4.

Sec. 11. Delivery of premises—At such time as all or portions of this lease are returned to lessor, lessee must place all wells in condition for suspension or abandonment, reclaim the land as specified by lessor, and within a reasonable period of time, remove equipment and improvements not deemed necessary by lessor for preservation of producible wells or continued protection of the environment.

Sec. 12. Proceedings in case of default—If lessee fails to comply with any provisions of this lease or other applicable requirements under 43 CFR 3200.4, and the noncompliance continues for 30 days after written notice thereof, this lease will be subject to termination in accordance with the Act and 43 CFR 3213. This provision will not be construed to prevent the exercise by lessor of any other legal and equitable remedy or action, including waiver of the default. Any such remedy, waiver, or action will not prevent later termination for the same default occurring at any other time. Whenever the lessee fails to comply in a timely manner with any of the provisions of the Act, this lease, the regulations, or other applicable requirements under 43 CFR 3200.4, and immediate action is required, the lessor may enter on the leased lands and take measures deemed necessary to correct the failure at the lessee's expense.

Sec. 13. Heirs and successors-in-interest—Each obligation of this lease will extend to and be binding upon, and every benefit hereof will inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

INSTRUCTIONS

A. General

1. Items 1 and 2 need to be completed only by parties filing for a noncompetitive lease. The BLM will complete the front of the form for other types of leases. The BLM may use the "Comments" space under Item 3 to identify when: the lessee has elected to make all lease terms subject to the Energy Policy Act of 2005 under 43 CFR 3200.7(a)(2) or 43 CFR 3200.8(b) (box labeled "converted lease" must also be checked); the lease is being issued noncompetitively to a party who holds a mining claim on the same lands as is covered by the lease under 43 CFR 3204.12; the lease is a direct use lease issued to a State, local, or tribal government (box at section 2(e) under Lease Terms must also be checked); the lease is a competitive lease with direct-use-only stipulations attached; or other special circumstances exist. A lessee who seeks to convert only the royalty rate of a lease under 43 CFR 3212.25 or who qualifies for a case-by-case royalty rate determination under 43 CFR 3211.17(b)(1)(i) should not use this form, but should instead use an addendum to the existing lease.

2. Entries must be typed or printed plainly in ink. The offeror must sign the form (Item 4) in ink.

3. An original and two copies of this offer must be prepared and filed in the proper BLM State Office. See regulations at 43 CFR 1821.10 for office locations.

4. If more space is needed, additional sheets must be attached to each copy of the form submitted.

B. Specific

Item 1—Enter the offeror's name and billing address.

Item 2—Indicate the agency managing the surface use of the land and the name of the unit or project of which the land is a part. The offeror may also provide other information that will assist in establishing status of the lands. The description of land must conform to 43 CFR 3203.10. Total acres applied for must not exceed that allowed by regulations (43 CFR 3203.10; 43 CFR 3206.12).

Payments: For noncompetitive leases, the amount remitted must include the processing fee for noncompetitive lease applications (43 CFR 3204.10; 43 CFR 3000.12) and the first year's rental at the rate of $1 per acre or fraction thereof. If the United States owns only a fractional interest in the geothermal resources, you must pay a prorated rental under 43 CFR 3211.11(d). The BLM will retain the processing fee even if the offer is completely rejected or withdrawn. To maintain the offeror's priority, the offeror must submit rental sufficient to cover all the land requested. If the land requested includes lots or irregular quarter-quarter sections, the exact acreage of which is not known to the offeror, rental should be submitted on the assumption that each such lot or quarter-quarter section contains 40 acres. If the offer is withdrawn or rejected in whole or in part before a lease issues, the BLM will return the rental remitted for the parts withdrawn or rejected.

The BLM will fill in the processing fee for competitive lease applications (43 CFR 3203.17; 43 CFR 3000.12) and the first year's rental at the rate of $2 per acre or fraction thereof.

Item 3—The BLM will complete this space.

NOTICES

The Privacy Act of 1974 and the regulation at 43 CFR 2.48(d) provide that you be furnished with the following information in connection with information required by this geothermal lease application.
AUTHORITY: 30 U.S.C. 1000 et seq.
PRINCIPAL PURPOSE—The information is to be used to process geothermal lease applications.
ROUTINE USES: (1) The adjudication of the lessee's rights to the land or resources. (2) Documentation for public information in support of notations made on land status records for the management, disposal, and use of public lands and resources. (3) Transfer to appropriate Federal agencies when concurrence is required prior to granting uses or rights in public lands or resources. (4) Transfer to the appropriate Federal, State, local, or foreign agencies, when relevant to civil, criminal, or regulatory investigations or prosecutions.

APPENDIX B

Reasonable and Foreseeable Development

Scenario

THIS PAGE INTENTIONALLY LEFT BLANK.

Appendix B

Reasonable and Foreseeable Development Scenario Haiwee Geothermal Leasing Area

November 18, 2009

Introduction

This Reasonable Foreseeable Development (RFD) scenario has been prepared as a basis for analyzing environmental impacts resulting from future leasing and development of federal geothermal resources within the Haiwee Geothermal Leasing Area (HGLA). As the name implies, the level and type of development anticipated in this RFD is a "best guess" of what may occur if these areas are leased. It is not intended to be a "maximum-development" scenario; however it is biased towards the higher end of expected development.

The foreseeable development described here could occur on any land within the HGLA (24,000 acres), regardless of surface or mineral ownership.

The anticipated total surface disturbance for the area is summarized below:

Region	BLM Disturbance (acres)	Total Disturbance (acres)
Haiwee Geothermal Leasing Area	353 (initial) 254 (final)	384 (initial) 276 (final)

Available Data and Assumptions

The HGLA encompasses about 38 sections, or approximately 24,000 acres. Of this, nearly all the land is BLM surface and subsurface. Of the 24,000 acre leasing area, only about 2,000 acres are non-federal, for a total federal area of about 22,000 acres. Included in the 22,000 acres of BLM-managed land are three pending lease applications covering about 4,500 acres.

This RFD will discuss total anticipated development for the entire 24,000 acres, and will use a simple ratio of 92% (22,000 acres/24,000 acres) for the anticipated development that could occur on BLM-managed land.

There are no direct data on which to base this RFD. There are no known temperature gradient wells in the immediate vicinity, nor have there been any deep exploration wells drilled in the area to date. Therefore, the basis of this RFD will be the proximity of the area to the Coso geothermal field, a field that currently produces approximately 2,00 MW (net) of electricity from a total of nine 30 megawatt (MW) geothermal turbine/generators.

The Coso field is located in an area of widespread ancient volcanic activity. This volcanic activity resulted from magma being intruded to unusually shallow depths, thereby providing a heat source for the geothermal field. The HGLA appears to be in the same general geologic regime.

The distance between the Coso geothermal field and the HGLA is about 10 to 15 miles. Proximity to a known producing geothermal field has little to do with the ultimate productivity of an area. However, from a geologic standpoint, there is a relatively high likelihood that some of the volcanic activity and fracturing in the Coso geothermal field may exist in the HGLA as well.

For the purpose of this RFD, it will be assumed that two 30 MW powerplants will be constructed and that the powerplants will have a useful life of 30 years. It will also be assumed that the productive areas will be less prolific than in the Coso geothermal field and will require more wells per MW than in the Coso geothermal field.

Potential Impacts

Exploration

Because there has not been any actual drilling in the leasing area, it will be assumed that some level of exploration will occur prior to full-field development. Exploration will include geophysical exploration such as seismic testing and the drilling of up to 20 temperature gradient wells.

Seismic testing can be either passive, to detect naturally-occurring events, or induced which would use small charges to create seismic reflections. Seismic testing typically requires the drilling of very shallow holes (less than 100 feet) for the placement of explosives or seismic monitoring devices. It will be assumed that the total surface disturbance relating to seismic testing will be two acres.

Temperature gradient wells are small diameter holes that cannot, by definition, penetrate a geothermal resource. The purpose of these wells is to identify areas that have the greatest amount of heat flow, which would be the most probable targets for production wells. It will be assumed that the total surface disturbance for each temperature gradient well is three acres, including the drilling location and the access road. It is likely that some of the drilling locations used for the temperature gradient wells will also be used for production wells. However, for the purpose of this RFD, it will be assumed that they will remain separate disturbances.

The total surface disturbance anticipated for exploration is 62 acres. It is anticipated that this will be a temporary impact as the 20 temperature gradient wells will be plugged and abandoned, and the 20 exploration well sites, along with the two acres disturbed by with seismic testing, will be reclaimed.

New wells

Surface Disturbance

To support 30 MW of net geothermal generation, a total of 15 production wells and seven injection wells will need to be drilled over the course of the estimated 30 year useful life of each powerplant. This includes both wells drilled initially, estimated to be nine production wells and three injection wells, and makeup or replacement wells, estimated to be six production wells and four injection wells, that will need to be drilled over the 30 year period to maintain the 30 MW of net production. It is anticipated that one new well will be drilled every three years. The wells would be located on up to five new well pads, with each pad large enough to accommodate the drilling of up to five wells. All wells on BLM-managed land will be permitted by BLM using standard review methods that ensure: 1) protection of ground water; 2) protection of public safety; and 3) that the environment is not unnecessarily or unduly damaged.

Each well is anticipated to be from 6,000 to 15,000 feet deep. However, these depths should not be considered a limiting factor when permitting because there is no strong correlation between depth and environmental impacts. In other words, an 18,000 foot well could be drilled with only slightly more impacts than a 15,000 foot well. The difference in impacts is within the high development bias of this RFD.

Because the resource is expected to be relatively deep, directional drilling would be practical and would result in drilling locations that could accommodate multiple wells. It will be assumed that at least five wells could be drilled from each well location. The assumption of five wells per location should not be considered a limiting factor in this RFD because additional wells could be drilled from an existing location with few additional impacts.

Each well pad will require approximately seven acres including cut and fill. As the topography is quite steep in parts of the HGLA, cut and fill could be significant.

Given the rugged topography, each well pad will need three miles of 30-foot wide access road and one mile of pipeline. It will be assumed that half the pipelines will follow the access roads in flatter areas, thereby adding 30 feet to the total width. It will also be assumed that the other half of the pipelines will be built in rugged areas and will go "cross country". These pipelines will require 100 feet of disturbance initially but after construction, only a 30 foot access road will remain.

Total foreseeable surface disturbance for new well pads, roads, and pipeline corridors associated with the wellfield for *each* 30 MW powerplant is summarized below:

Description	Unit Surface Disturbance (acres)	Number	Total Surface Disturbance (acres)
Well pads	7	5	35
Access roads	3.6 acres/mi	15 miles	54
Flat-land Pipelines	1.2 acres/mi	2.5 miles	3
Rugged-land Pipelines (initial)	3.6 acres/mi	2.5 miles	9
Rugged-land Pipelines (final)	1.8 acres/mi	2.5 miles	5
Total Disturbed Acres - Wellfield			101 acres (initial) 97 acres (final)

Considering the surface disturbance from two wellfields to supply geothermal resources to the two 30 MW powerplants, the initial ***total*** surface disturbance would be 202 acres (101 acres x 2) and then about 194 acres (97 acres x 2) after reclamation.

Noise

Each well is expected to take between 90 and 150 days to drill. During this time, high levels of noise will be generated by the diesel engines that power the drilling rig and air compressors/mud pumps, as well as from the drawworks, drawworks brake, racking of pipe, and well testing. The racking of pipe and drawworks brake are higher pitched noises that typically travel further and are more difficult to mitigate than sources such as diesel engines. All diesel engines will use mufflers per standard industry practice. All well testing will be done through mufflers to reduce noise. Up to three drilling rigs could be in operation simultaneously and drilling is expected to take place 24 hours a day, seven days per week.

Air Quality

Diesel engine exhaust, well testing, and dust are the primary impacts to air quality from the drilling of wells. Vented steam during a well test can contain significant amounts of dust, hydrogen sulfide, and other non-condensable gases. Hydrogen sulfide emissions are abated through the injection of hydrogen peroxide and sodium hydroxide into the test line. Dust emissions from well testing are reduced by injecting water into the test line. Dust emissions from roads can be mitigated by periodic watering.

Ground Water

It is unknown whether there are Underground Sources of Drinking Water in the HGLA, but given the geology, significant ground water sources are unlikely. If ground water does occur, geothermal wells include multiple casing strings at shallow depths where aquifers are most likely to exist. For a 9,000 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 to 4,000 to 6,000 feet. All casing is cemented in place using standard industry practice. In addition, all injection wells are required to be periodically tested for mechanical integrity. The testing protocol will depend on the nature of any aquifers and the type of resource encountered

Powerplants

Surface Disturbance

Based on the type of reservoir encountered at the Coso geothermal field, it is anticipated that two dual flash powerplant locations will be built to utilize the hot water and steam from the leases in the HGLA. Each powerplant will be capable of generating 30 MW (net) of electricity.

In a dual flash powerplant, hot water from the wells is first sent to a high pressure separator where the pressure is reduced, thereby causing some of the hot water to flash to steam. The steam is sent to a high pressure turbine. The hot water that is not flashed to steam is then sent to a low pressure separator where the pressure is once again reduced and some of the hot water flashes into low pressure steam. The low pressure steam is sent to a low pressure turbine. Whatever hot water is not flashed into steam is sent to an injection well. Typically, this process only flashes 20% to 30% of the hot water into steam, on a mass basis.

After leaving the turbine, both the high and low pressure steam are condensed into water and then sent to a cooling tower for further temperature reduction. The cool water is circulated through the condenser to increase plant efficiency. Water that is not evaporated in the cooling process or used in the condenser loop is also sent to an injection well.

Each plant location would require about 20 acres, which would be 25 acres of total surface disturbance including cut and fill. Each plant would also require three miles of access road and four miles of new transmission line to intertie with an existing transmission line that runs through the southwest portion of the HGLA. It is assumed that the access road will 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 20foot access road would be reclaimed with native vegetation.

The total surface disturbance for both powerplants is summarized in the following table:

Description	Unit Surface Disturbance (acres)	Number	Total Surface Disturbance (acres)
Powerplant location	25 acres/powerplant	2 powerplants	50
Access roads	3.6 ac/mi	6 miles	22
Transmission lines - initial	12.1 ac/mi	4 miles	48
Transmission lines - final	2.4 acres/mi	4 miles	10
Total Disturbed Acres - Powerplants			120 (initial) 82 (final)

Noise

Powerplant noise usually entails a constant low-level hum primarily created by the cooling tower fans.

Air Quality

A dual flash plant will discharge any non-condensable gases that are produced with the steam including carbon dioxide, methane, ammonia, and hydrogen sulfide. However, local air quality districts typically have strict limits on hydrogen sulfide emissions. To mitigate hydrogen sulfide emissions, the hydrogen sulfide gases are scrubbed from the steam using a "Stretford", iron kealate, or burner process.

Visual

Powerplants will be sited using terrain to obstruct visual impacts to the extent possible. All facilities will also be painted a color that blends into the natural setting. Steam plumes from the cooling towers, may rise several hundred feet above the cooling towers on cold, clear days, but may be absent on warm, dry days, especially in summer.

Seismic impacts

Development at The Geysers geothermal field has resulted in the creation of micro-seismic events that seem to be tied to production and/or injection. This has been a cause for concern in the development of other geothermal fields as well. The Geysers is a unique dry-steam resource that is only found in two or three other places in the world. Induced seismicity is not typical to geothermal development. The induced seismicity experienced at The Geysers is less than magnitude 3.0 on the Richter scale. While larger earthquakes do occur within The Geysers, there is little evidence that these are tied to geothermal activity. More likely, the larger events are related to naturally-occurring movement along the many faults in the area.

Environmental analysis done at The Geysers has concluded that while micro-seismic events are a result of geothermal activity, these events are not large enough to cause structural damage to homes or other improvements. Therefore, this has not been considered a significant impact.

APPENDIX C

Rose Valley Groundwater Chemistry

THIS PAGE INTENTIONALLY LEFT BLANK.

APPENDIX C

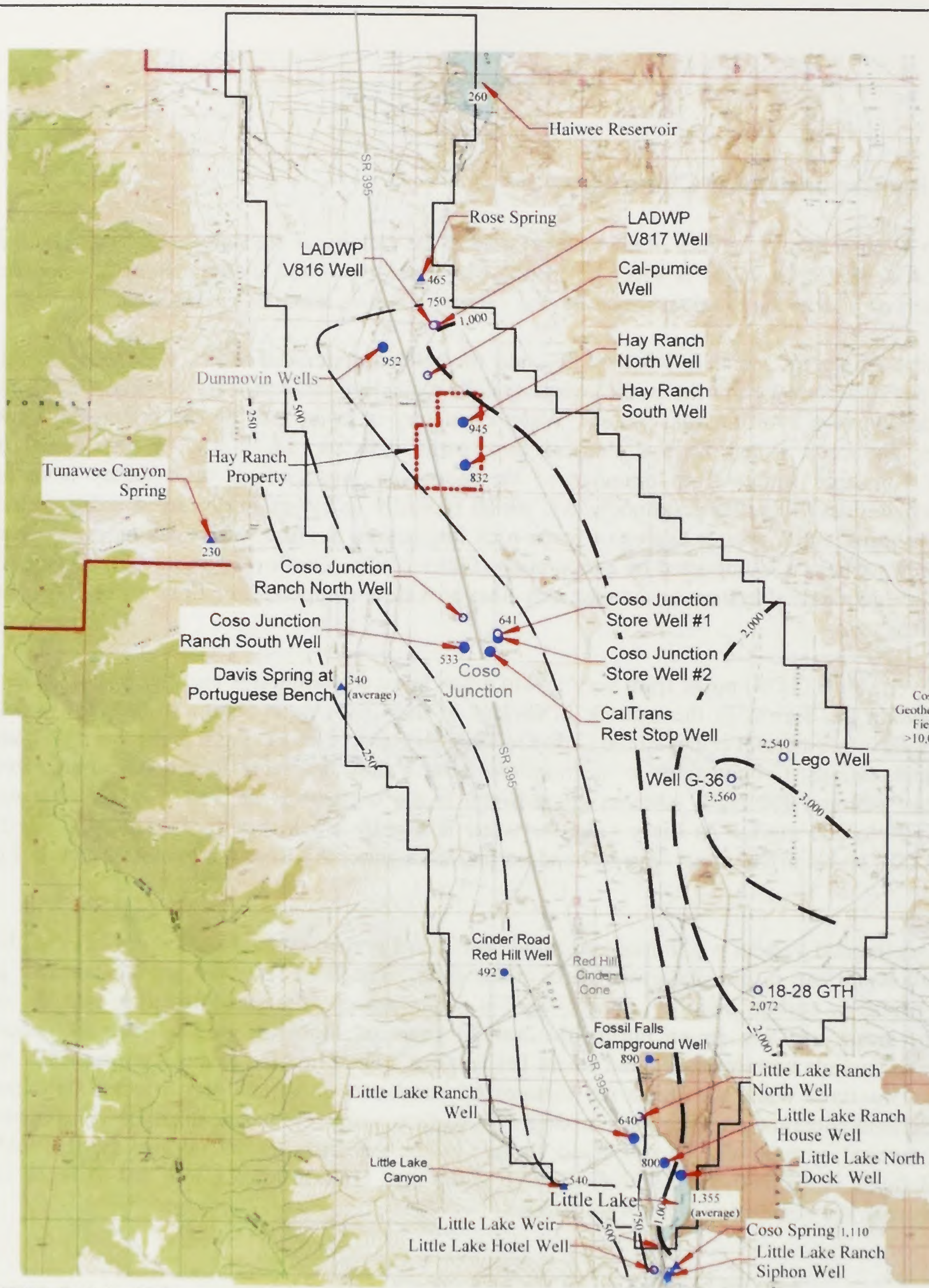
Rose Valley Groundwater Chemistry

This section discusses the chemistry of the waters found in the vicinity of the Haiwee Geothermal Leasing Area (HGLA). Particular focus is given to identifying water types and distinguishing the sources of various waters as well as the relationship between a variety of waters identified in the area.

The chemistry of waters found in Rose Valley and the related watershed varies widely reflecting the multiple types of waters within the hydrological system typical of the semi-arid western United States with the addition of a hydrothermal system. Water chemistry is influenced by the interaction between groundwater and rock along the hydrological flow paths with the addition of a geothermal brine component. Recharge waters from drainage of the mountains surrounding Rose Valley have lower dissolved solids than the valley's groundwater, which typically is higher in dissolved solids reflecting longer transit times and a greater degree of water-rock interaction. Surface waters can be even higher in dissolved solids where it is impacted by evaporation (Güler 2002). Outflow of saline geothermal brines from the Coso geothermal system to the east may also provide a component of flow to the Rose Valley hydrological system.

Total dissolved solids (TDS) range from very low to a few hundred milligrams per liter (mg/L) in surface streams draining the Sierras to the west or in springs of the Coso-Argus Range to the east to several thousand mg/L in geothermal brines in the Coso Geothermal Reservoir to the east and related geothermal surface manifestations. Groundwater in the northern Rose Valley near Hay Ranch is characterized by TDS between 800 and 900 mg/L whereas groundwater in the southern Rose Valley is characterized by TDS from 500 to 700 mg/L. At Little Lake the water is slightly brackish with TDS from 1,500-2,500 mg/L. The TDS levels in the upper several hundred feet throughout the Rose Valley are shown in Figure C-1.

The Coso geothermal system was initially a liquid-dominated system containing sodium chloride brines with a small steam cap in the shallowest parts of the field. The fluids contain non-condensable gases which are primarily carbon dioxide. Where there is steam present, the gases partition into the steam phase. The steam cap has grown during the last 20 years of supplying power generation. Surface manifestations include both brine-fed and steam-fed features. The brine fed features are typically brine-groundwater mixtures while the steam-fed features are mud-pots and fumaroles affected by steam or steam condensate containing acidic gases mixing with surface waters or surface material. The chemistry of the geothermal system will be discussed further in the sections below. While the TDS of the geothermal fluids is distinctly higher than the rest of the area (10,000 mg/L), it is not included in the contours because the connection is not well defined.



SOURCE: Geologica 2008

Figure C-1 Distribution of Total Dissolved Solids in Rose Valley

Hydrochemical Analyses and Water Types

Chemical analysis of water samples collected in the Rose Valley and vicinity indicates that there are several distinct water types. Sierran waters (and minor amounts of water from the Coso Range) recharge the area (Güler 2002, Williams 2004). There also appears to be or to have been a small inflow of subterranean discharge from the Coso Geothermal System which reaches as far as the LEGO well. The chemistry and isotopic signatures of the other types of water suggest that the Rose Valley hydrological system contains waters that have followed different and sometimes complex pathways from their mountain sources to points of discharge.

Güler (2002), and Williams (2004) compiled an extensive database of chemical analyses of waters within the area to evaluate and characterize water quality. They grouped the waters within the area into several water types:

- Sierran: springs and streams that drain the Sierras; calcium (Ca)- (sodium, Na)-bicarbonate (HCO3); average TDS≈200 mg/L
- Indian Wells Rose Valley: springs, streams and shallow groundwater in basins along the eastern side of the Sierra; Na-Ca-HCO3-(sulfate, SO4); average TDS≈700 mg/L
- Coso-Argus Group: surface and spring samples from the Coso and Argus Ranges; Ca-HCO3 - average TDS≈500 mg/L
- Little Lake Group: Samples from Little Lake and surrounding springs; Na-(Mg)-HCO3 -Cl; average TDS≈1,200 mg/L
- Geothermal Brine: from deep (500-3,000 m Coso geothermal reservoir); Na-Cl; TDS≈10,000 mg/L

To these we add two types of waters found at Coso Hot Springs:

- Geothermal steam-fed surface fluid
- Geothermal brine-fed surface fluids

Waters in the vicinity of the program area have also been classified based on the relationship to the point of recharge; the chemistry of water in Basin and Range-type hydrological systems can be explained by increasing degrees of water-rock interaction and chemical evolution. High Sierra recharge waters (Group 1) are Ca-Na-HCO3 water with average TDS of 67 mg/l where as low elevation Sierra and Coso Range waters and basin fill groundwaters (Group 2) are slightly more evolved based on water-rock interaction and are typically Na-Ca-HCO3 water with average TDS of 356 mg/l. The waters in the program area are primarily Group 1 and 2 types, but within the area slightly to the north, there are more concentrated and evolved waters. Group 3 are transitional Na-HCO3-Cl waters typically found on basin floors with an average TDS of 1018 mg/l representing greater evolution. Group 4 are brackish Na-CL waters with average TDS of 5133 mg/l and Group 5 are brines with an average TDS of 94,000 mg/l.

Figure C-2 shows the distribution of these waters in the vicinity of the HGLA. Geothermal waters represent waters with higher degrees of water rock interaction partially influenced by higher temperatures, interaction with different minerals and the influence of magmatic influx. Although they are primarily NaCl brines, they are not included in this classification.

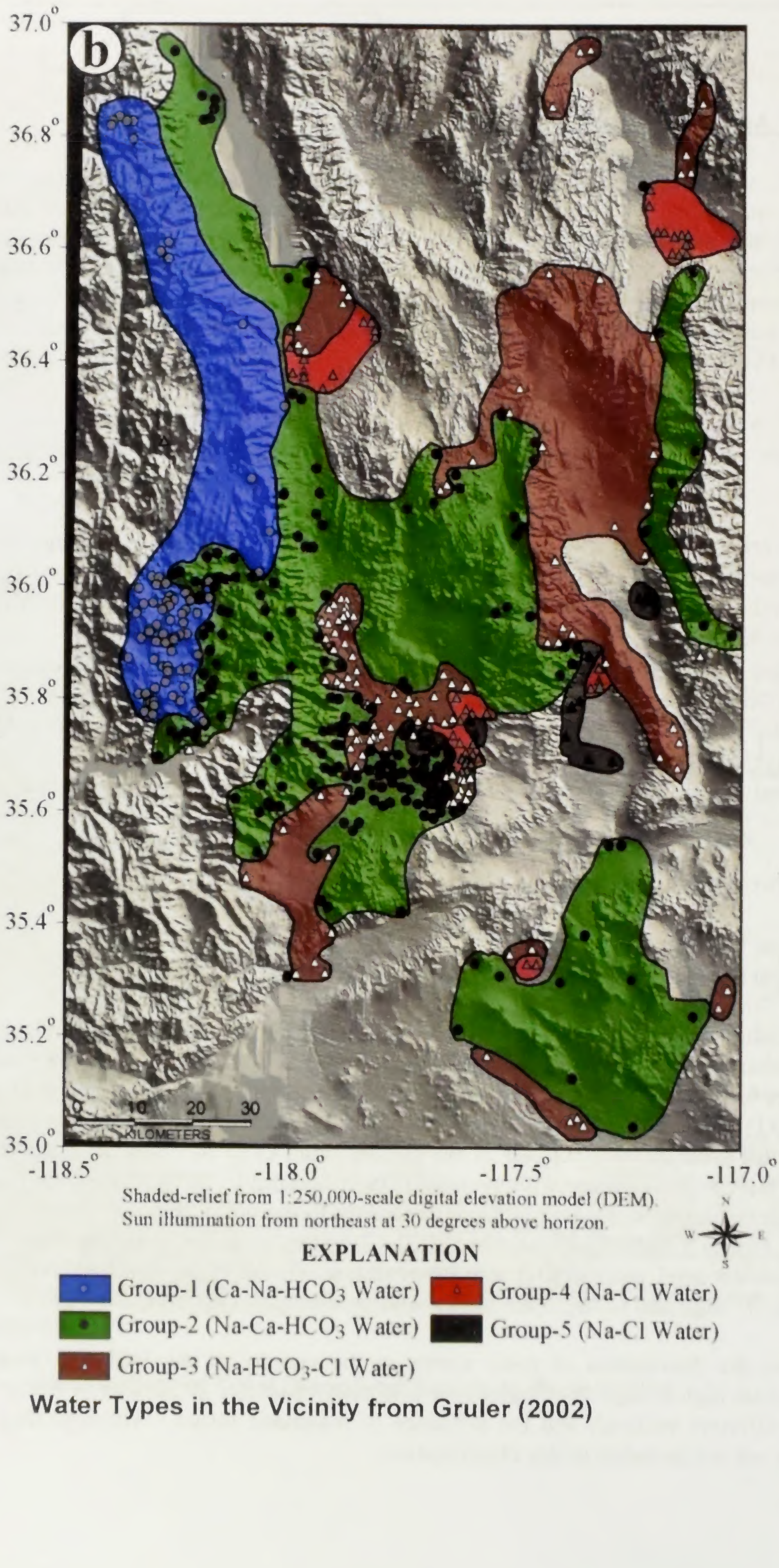


Figure C-2 **Water Types in the Vicinity from Gruler (2002)**

A review of chemical and isotopic analysis of water samples from Rose Valley and the adjacent mountains suggests that Sierran, Indian Wells-Rose Valley (IWRV), Little Lake (LL), and possibly a component of geothermal brine water types are present in Rose Valley groundwater. Within the IWRV type, Portuguese Bench, Coso Junction, and Hay Ranch waters are clearly distinguished from each other and from Little Lake and geothermal waters, particularly in the conservative element of chloride. Little Lake waters, represented by the LL Ranch House Well, LL (an average of surface waters), and the Coso Spring are clearly distinguished from other Rose Valley groundwaters by higher concentrations of all constituents except Ca and Mg. The only exception is the geothermal-influenced LEGO and 18-28 GTH wells. Williams (2004) suggests that elevated Na relative to Ca, Mg, and Cl, as well as boron (B) and lithium (Li) indicate a geothermal component in Little Lake waters. However, the elevated chloride in Little Lake waters may also be a result of evaporation (concentration) of waters from nearby Sierran recharge from the west (as represented by Little Lake Canyon Spring) combined with groundwater flow down the valley (represented by Little Lake north well water).

Hay Ranch groundwater appears to be a more concentrated version of Haiwee Reservoir water. The dominance of sulfate in waters in the northern part of Rose Valley (Hay Ranch and Dunmovin) distinguishes these waters from the rest of the valley. Although the Hay Ranch wells were drilled deeper than many of the other wells in the valley, the Dunmovin well is not, so depth alone probably does not produce the difference in water chemistry. Concentration of these waters by evaporation would not produce the chemistry of the Little Lake waters, suggesting that other waters must mix with the northern Rose Valley waters as they flow southward towards Little Lake prior to evaporation in the Lake which produces the distinct chemistry of Little Lake water.

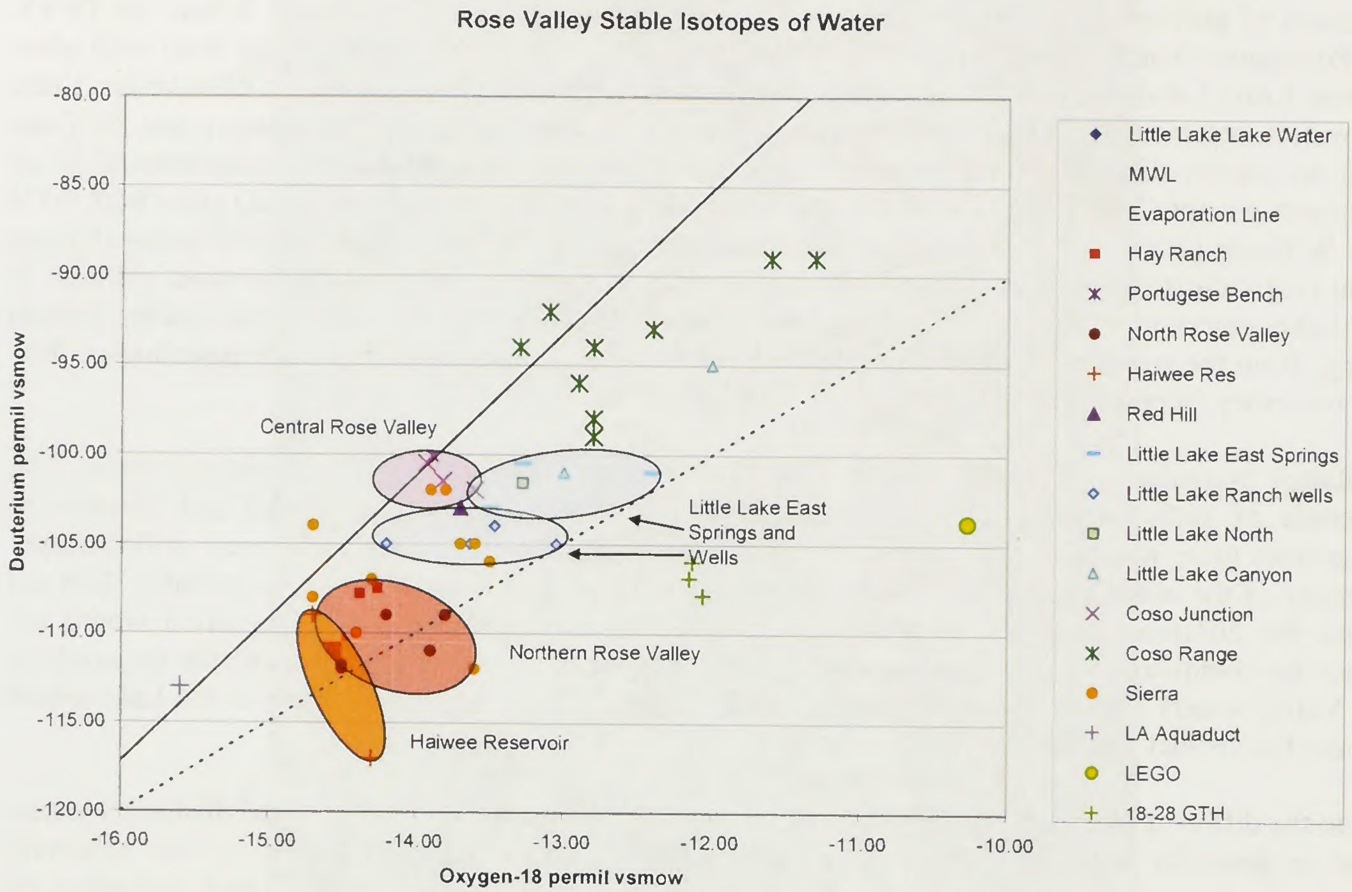
Despite the different chemistries of waters at discharge points within Rose Valley watershed most waters appear to generally have the same origin. Similar boron/chloride ratios (the ratio of two relatively conservative elements) support similar origins. Boron/chloride ratios within the Hay Ranch watershed are similar to water from the Sierras and to the Coso geothermal waters suggesting that although various processes change the absolute concentrations of these conservative elements, the source of the water is likely precipitation in the Sierra and Coso Ranges.

Isotope Data

Stable water isotope (oxygen-18 and deuterium) signatures are commonly used to evaluate the origins of waters. Isotope concentrations of waters from within the Rose Valley and its watershed reflect variable sources as well as evaporation. Stable isotopic data for Rose Valley waters was collected from numerous sources (MHA-RHT 2009) from analysis in many laboratories over many years. Within single data sets variation of oxygen-18 is around $\pm 0.2^{0}/_{00}$ and deuterium is approximately $1^{0}/_{00}$, the range of variability around the data presented below is probably greater that these numbers.

Evaporation enriches waters in the heavier stable isotopes making the waters less isotopically negative. At first glance, the stable isotopes of Little Lake waters appear different from all other waters. These differences can be explained by isotopic fractionation which occurs during the evaporation of these shallow lakes (Figure C-3).

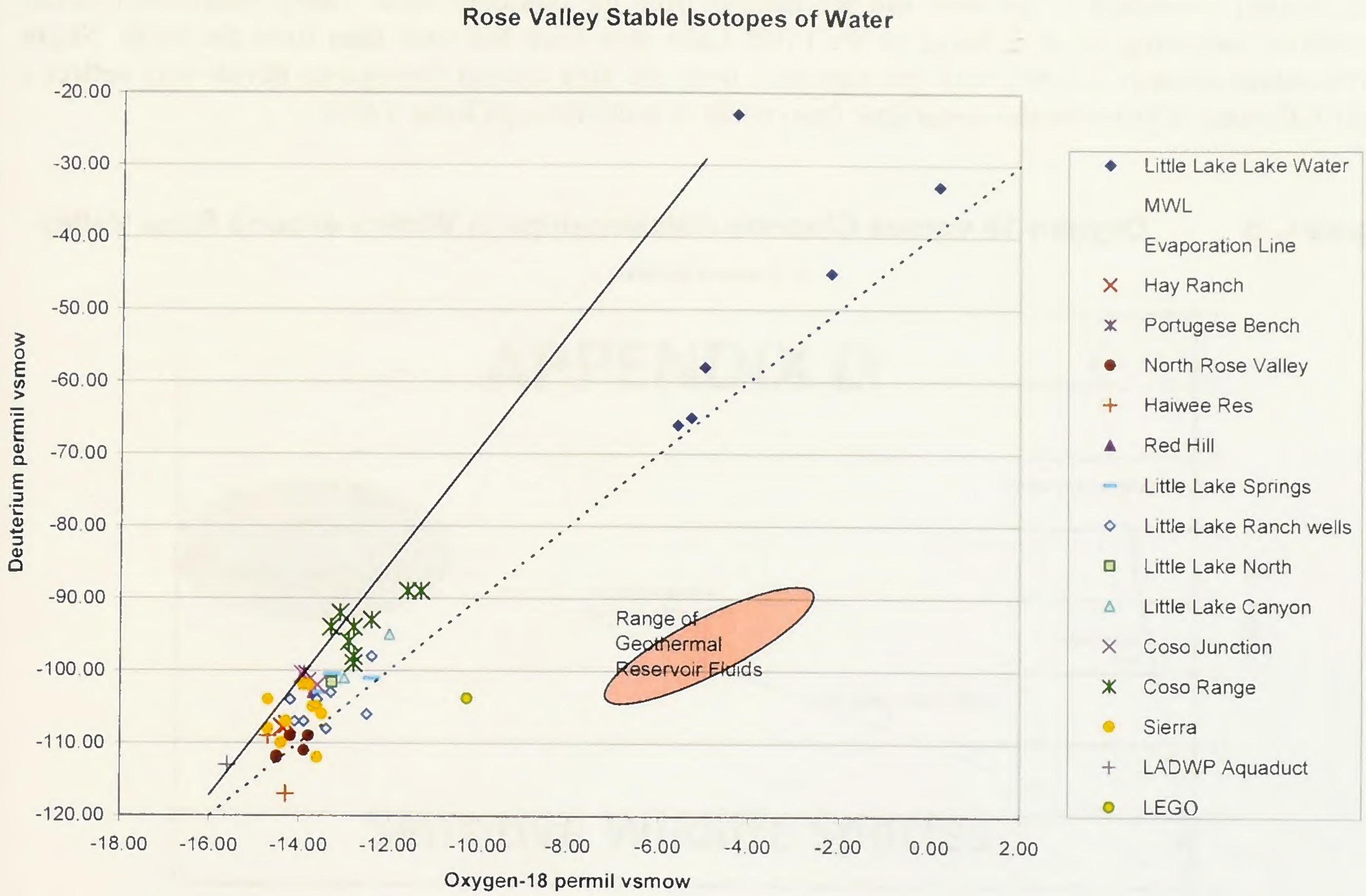
Figure C-3 Stable Isotopes of Rose Valley excluding the lake water from Little Lake



SOURCE: Fournier and Thompson (1980), Guler (2002), Geotrans, (2004), Coso Operating Company (2007), US Navy GPO (2007 and 2008).

Based on stable isotopic composition of groundwater represented by well and spring waters (minimizing the effect of evaporation), sources of groundwater from the northern to the southern end of the valley can be distinguished from each other. These differences may in part reflect differences in recharge from the Sierra, which is isotopically lighter (more negative) to the north as represented by the Los Angeles Department of Water and Power (LADWP) Aqueduct water and Haiwee Reservoir and isotopically heavier (less negative) in the south. The Haiwee reservoir sample may also be influenced by evaporation. The stable isotopic signature of the northern part of the Valley (including Hay Ranch waters) is similar to the Haiwee Reservoir and the highest or more northerly Sierras. Portuguese Bench and Coso Junction waters appear to be similar to each other and isotopically more like the Sierras farther south than Haiwee and more directly west of Rose Valley (Figure C-4). Thus, the isotopic signature of Rose Valley groundwaters suggest that there is recharge from the Sierras all along the north-south axis of the valley, with different isotopic signatures, in addition to some valley underflow from north to south.

Figure C-4 Stable Isotopes of Waters from Rose Valley and Vicinity



SOURCE: Fournier and Thompson (1980), Guler (2002), Geotrans, (2004), Coso Operating Company (2007).

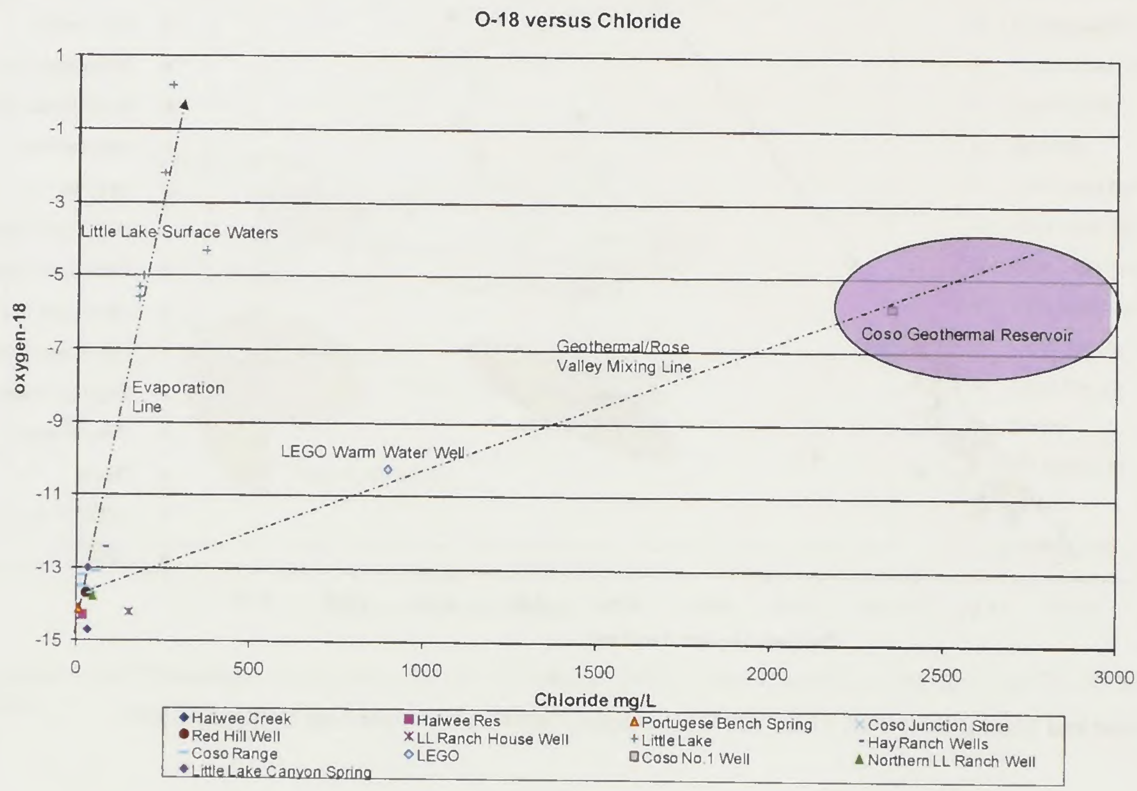
The isotopic signature of groundwater in wells or springs down gradient from Little Lake (i.e., Little Lake East Spring, also known as Coso Spring, and Little Lake Ranch Wells) is probably affected by the isotopic shift related to evaporation of the lake water. Therefore, the Little Lake North Well probably represents un-evaporated recharge to the Lake from groundwater whereas Little Lake Canyon spring may indicate recharge to the Little Lake from the west. The source waters for Little Lake appear to be either:

1) From the Sierran source area similar to Portuguese Bench springs with a longer subsurface pathway (which increases oxygen-18 by water-rock interaction but not deuterium), or
2) Predominantly Portugese Bench type Sierra water and a small amount of geothermal water (or geothermal mixed water), or
3) Predominantly Portuguese Bench type Sierra water and a small amount of Rose Valley underflow from the north.

If the major source of Little Lake water was directly from the Hay Ranch area via subsurface groundwater flow, significant evaporation would have to occur prior to arriving at Little Lake which is unlikely. In addition groundwater flow within the Rose Valley would have a major diversion around Coso Junction. While the chloride concentrations in Little Lake water could be produced by mixing a component of the geothermal water from the east, the combination of isotopic signature and chloride concentrations in Little Lake are most likely generated by evaporating water similar to that observed in the Little Lake

North Well or in the Little Lake Canyon Spring to the west or a combination of the two (Figure C-5). In either case, water isotopes suggest the water sources for the Little Lake area are predominantly from the local Sierran watershed to the west and are distinct from the Northern Rose Valley water chemistries, potentially indicating more recharge to the Little Lake area from the west than from the north. Slight displacement towards a lighter isotopic signature from the area around Portuguese Bench may reflect a slight influence of groundwater underflow from north to south through Rose Valley.

Figure C-5 Oxygen-18 versus Chloride Relationships in Waters around Rose Valley



Water Potability

Drinking water quality (potability) of waters within the Rose Valley ranges from excellent to marginal. Available data (MHA-RMT, 2009) indicate that Hay Ranch waters exceed primary drinking water standards (EPA, 2003) for arsenic, nitrate and nitrite. Secondary drinking water standards are primarily related to aesthetics and taste. Several waters exceed the secondary drinking water standard levels for TDS and sulfate. Recent analysis of water samples from the Hay Ranch wells indicates the water does not meet secondary drinking water standards for TDS, sulfate, iron and manganese.

APPENDIX D

Sensitive Wildlife Species

THIS PAGE INTENTIONALLY LEFT BLANK.

Appendix D

Table D-1 Sensitive Wildlife Species with Potential to Occur within the Haiwee Action Area

Scientific Name	Species	Listing Status: FEDERAL	Listing Status: STATE	Listing Status: OTHER	Habitat Requirements	Potential for Occurrence
Birds						
Accipiter gentilis	Northern Goshawk	BLM Sensitive		DFG SC	Within, and in the vicinity of, coniferous forest. Uses old nests and maintains alternate sites. Usually nests on north slopes, near water; red fir, lodgepole pine, Jeffrey pine, and aspens are typical nest trees.	**Low.** Small area with potential habitat. It is determined that development in the action area may affect, but is not likely to adversely affect, this species.
Aquila chrysaetos	Golden Eagle			DFG FG, USFWS BCC	Species occur in open habitats, especially in the mountains and hills, where it can spot prey from the air. They nest atop tall trees or high on rocky cliffs. Golden Eagles are uncommon year-round residents in Inyo County.	**High.** Small area with potential habitat. It is determined that development in the action area may affect, but is not likely to adversely affect, this species.
Asio otus	Long-eared owl			DFG SSC	Long-eared Owls inhabit open woodlands, forest edges, riparian strips along rivers, hedgerows, juniper thickets, woodlots, and wooded ravines and gullies.. Roosting sites are usually in the heaviest forest cover available	**Low.** Small area with potential habitat. It is determined that development in the action area may affect, but is not likely to adversely affect, this species.
Athene cunicularia	Burrowing Owl	BLM Sensitive		DFG SC	Lowlands throughout California, including the Central Valley, northeastern plateau, southeastern deserts, and coastal areas. Uses rodent burrows in sparse grassland, desert, and agricultural habitats.	**High.** Suitable open habitat is found sporadically throughout the action area, especially in the open disturbed areas and grasslands. It is determined that development in the action area may affect, but is not likely to adversely affect, this species.
Buteo swainsoni	Swainson's Hawk		ST		Breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs, agricultural areas, and ranches. Requires adjacent suitable foraging areas such as grasslands, or alfalfa or grain fields supporting rodent populations.	**Moderate.** Small area with potential habitat. It is determined that development in the action area may affect, but is not likely to adversely affect, this species.
Falco peregrinus	Peregrine falcon	Delisted	SE		Near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds, and man-made structures. Nest consists of a scrape on a depression or a ledge in an open site.	**Moderate.** Small patches of potential habitat found in western portion of the action area. It is determined that development in the action area may affect, but is not likely to adversely affect, this species,
Haliaeetus leucocephalus	Bald Eagle	Delisted	ST		Ocean shore, lake margins, and rivers for both nesting and wintering. Most nests are within one mile of water. Nests in large, old-growth or dominant live trees with open branches, especially Ponderosa pine. Roosts communally in winter.	**Low.** Insufficient open aquatic habitat within the action area. It is determined that development in the action area will not affect this species.
Lanius ludovicianus	Loggerhead Shrike			DFG SSC, USFWS BCC	The Loggerhead Shrike occupies open country with lookout perches, woodlands, open scrub, and the margins of dry grasslands. It is a fairly common year-round resident in Inyo County.	**Moderate.** Loggerhead Shrikes are expected to occur and nest in low numbers throughout the action area, especially near the transmission line corridors, where they can perch high above the

Table D-1 Sensitive Wildlife Species with Potential to Occur within the Haiwee Action Area

Scientific Name	Species	Listing Status: FEDERAL	STATE	OTHER	Habitat Requirements	Potential for Occurrence
						habitat to search for prey. It is determined that development in the action area may affect, but is not likely to adversely affect, this species.
Toxostoma lecontei	Le Conte's Thrasher	BLM Sensitive		DFG SSC, USFWS BCC	Inhabit low, hot, barren deserts and valleys, usually in regions of scant vegetation where the bird's light color blends with the sandy gravel environment. In Inyo County Le Conte's Thrashers are uncommon, year-round residents.	**Low**. They are expected to occur and nest infrequently and in low numbers throughout the action area.
Mammals						
Antrozous pallidus	Pallid Bat	BLM Sensitive, FSC		DFG SSC, WBWG: H	Deserts, grasslands, shrublands, woodlands and forests. Most common in open, dry habitats with rocky areas for roosting. Roosts must protect bats from high temperatures. This species is very sensitive to disturbance of roosting sites.	**High**. Potential foraging habitat in action area, but very limited rocky roosting habitat.
Corynorhinus tonwsendii	Townsend's Big-Eared Bat	BLM Sensitive, FSC		DFG SSC, WBWG: H	Occurs throughout California in a variety of habitats, but most common in mesic sites. Roosts in the open, hanging from walls or ceilings. Very sensitive to human disturbance.	**High.** Known sightings in the vicinity of the action area. It is determined that development in the action area may affect, but is not likely to adversely affect, this species.
Lasionycteris noctivagans	silver-haired bat			WBWG: H	Silver-haired bats are among the most common bats in forested areas of the United States. They are considered to be a solitary, tree-roosting species	**High.** Known sightings in the vicinity of the action area. It is determined that development in the action area may affect, but is not likely to adversely affect, this species.
Lasiurus blossivillii	Western Red Bat			DFG SSC, WBWG: H	Roosts primarily in trees, 2 to 40 feet off the ground. Occurs from sea level up through mixed conifer forests. Prefers habitat edges and mosaics with trees that are protected from above and open below, with open areas for foraging.	**High.** Known sightings in the vicinity of the action area. It is determined that development in the action area may affect, but is not likely to adversely affect, this species.
Spermophilus mohavensis	Mohave Ground Squirrel		ST		Open desert scrub, alkali scrub and Joshua tree woodland. Also feeds in annual grasslands, restricted to Mojave desert. Prefers sandy to gravelly soils, avoids rocky areas, uses burrows at base of shrubs for cover. Nests are in burrows.	**Present.** Known sightings in the vicinity of the action area. It is determined that development in the action area may adversely affect this species.
Taxidea taxa	American Badger			DFG SSC	It is most abundant in drier, open sites with friable soils in most shrub, forest, and herbaceous habitats. Badgers dig burrows for shelter and for natal dens.	**High.** Species is expected to occur and previous surveys have documented the species sign (i.e., dens, scat) within the action area. It is determined that development in the action area may affect, but is not likely to adversely affect, this species.
Vulpes macrotis arsipus	Desert Kit Fox			Ca Fur-bearing Mammal		**High.** Species is expected to occur and previous surveys have documented the species sign (i.e., dens, scat) within the action area. Multiple

Table D-1 Sensitive Wildlife Species with Potential to Occur within the Haiwee Action Area

Scientific Name	Species	Listing Status			Habitat Requirements	Potential for Occurrence
		FEDERAL	STATE	OTHER		
						habitats including desert scrub, saltbush, chaparral, and grassland.
Reptiles						
Gopherus agassizii	Desert Tortoise	FT	ST		Most common in desert scrub, desert wash and Joshua Tree habitats; occurs in almost every desert habitat. Requires friable soil for burrow and nest construction creosote bush habitat with annual wildflower blooms.	**Present.** Occurrence records exist for the species in the vicinity of the action area and suitable habitat exists. Additionally, known range of the desert tortoise includes Indian Wells Valley and Rose Valley (BLM 2005). Surveys conducted in 2009 found desert tortoises or their sign in low densities throughout these areas (Laberteaux 2009). It is determined that development in the action area may affect, but is not likely to adversely affect, this species.
Sceloporus graciosus gracisois	*Northern sagebrush lizard*	BLM Sensitive		DFG SSC	Occurs in the Great Basin and mountainous areas, inhabiting montane chaparral, hardwood and conifer habitats, eastside pine and juniper habitats, and Great Basin shrub habitats of the Sierra Nevada and the Cascades. Isolated populations occur at Sutter Buttes in the Sacramento Valley, in the Coast Range, and in the desert mountains of Inyo County.	**High.** Known sightings in the vicinity of the action area. It is determined that development in the action area may affect, but is not likely to adversely affect, this species.

Status Codes
FE Federally listed as Endangered
FT Federally listed as Threatened
FPE Federally proposed for listing as Endangered
FPT Federally proposed for listing as Threatened
FPD Federally proposed for delisting
FC Federal candidate species (former Category 1 candidates)
FSC Species of Concern
SE State-listed as Endangered

Status Codes
ST State-listed as Threatened
SCE State candidate for listing as Endangered
SCT State candidate for listing as Threatened
SCD State candidate for delisting
BLM Sensitive
DFG SC: Department of Fish and Game Species of Concern
DFG FP: Department of Fish and Game Fully Protected Species
USFWS BCC: Fish and Wildlife Service Birds of Conservation Concern
WSBG:H The Western Bat Working Group Species designated as "High Priority

Potential for Occurrence (PFO)
Absent from Site – Species is restricted to habitats that do not occur within the action area.
Low Potential for Occurrence – No historical records exits of the species occurring within the action area or its immediate vicinity, and/or the habitats needed to support the species on the site are of poor quality.
Moderate Potential for Occurrence –Either a historical record exists of the species within the immediate vicinity of the action area and/or the habitat requirements associated with the species occur within the action area
High Potential for Occurrence – Both a historical record exists of the species within the action area or its immediate vicinity and the habitat requirements strongly associated with the species occur within the action area.
Species Present – The species is known to occur.

THIS PAGE INTENTIONALLY LEFT BLANK.

APPENDIX E

Demographics

THIS PAGE INTENTIONALLY LEFT BLANK.

Appendix E

Table E-1 Race and Ethnicity Composition in Counties and CCDs of the Haiwee Geothermal Leasing Area SSA (2000 Census)

	Total	White alone	% of total	African American alone	% of total	American Indian and Alaska Native alone	% of total	Asian alone	% of total	Hawaiian and Other Pacific Islander alone	% of total	Some other race alone	% of total	Population of two or more races:	% of total	Hispanic or Latino	% of total
California			59.5%		6.7%		1.0%		10.9%		0.3%		16.8%			10,966,556	32.4%
Inyo County	17,945	14,367	80.1%	29	0.2%	1,802	10.0%	163	0.9%	15	0.1%	825	4.6%	744	4.1%	2,257	12.6%
Independence CCD	2,612	1,952	74.7%	6	0.2%	419	16.0%	12	0.5%	5	0.2%	76	2.9%	142	5.4%	215	8.2%
Lone Pine CCD	2,479	1,973	79.6%	2	0.1%	183	7.4%	21	0.8%	1	0.0%	181	7.3%	118	4.8%	587	23.7%
Kern County, California	661,645	407,581	61.6%	39,798	6.0%	9,999	1.5%	22,268	3.4%	972	0.1%	153,610	23.2%	27,417	4.1%	254,036	38.4%
East Kern CCD	69,614	53,884	77.4%	3,995	5.7%	925	1.3%	2,251	3.2%	268	0.4%	5,050	7.3%	3,241	4.7%	10,995	15.8%
San Bernardino County	1,709,434	1,006,960	58.9%	155,348	9.1%	19,915	1.2%	80,217	4.7%	5,110	0.3%	355,843	20.8%	86,041	5.0%	669,387	39.2%
Red Mountain-Trona CCD	2,293	1,994	87.0%	34	1.5%	52	2.3%	14	0.6%	9	0.4%	106	4.6%	84	3.7%	323	14.1%
Three-County Region	2,389,024	1,428,908	59.8%	195,175	8.2%	31,716	1.3%	102,648	4.3%	6,097	0.3%	510,278	21.4%	114,202	4.8%	925,680	38.7%
CCDs in Study Area	**76,998**	**59,803**	**77.7%**	**4,037**	**5.2%**	**1,579**	**2.1%**	**2,298**	**3.0%**	**283**	0.4%	**5,413**	**7.0%**	**3,585**	4.7%	**12,120**	**15.7%**

Source: United States Department of Commerce (2000a).

THIS PAGE INTENTIONALLY LEFT BLANK.

Table E-2 Age and Gender Composition in the Counties and CCDs of the Haiwee Geothermal Leasing Area SSA (2000 Census).

	Total:	Male	Under 5 years	Under 18 years	18 to 64 years	65+	Median Age	Female:	Under 5 years	Under 18 years	18 to 64 years	65+	Median Age
Inyo County	17,945	9,254	493	2,226	5,050	1,485	42.2	9,184	468	1,682	5,090	1,944	43.6
Lone Pine CCD	2,479	1,287	83	303	686	215	42.8	1,275	68	244	691	272	43
Independence CCD	2,612	1,312	64	286	706	256	43.8	1,364	64	237	735	328	45.8
Kern County	661,645	367,927	28,545	108,449	204,026	26,907	30	322,263	27,162	75,768	184,186	35,147	31.4
East Kern CCD	69,614	38,064	2,747	10,816	21,237	3,264	33.5	34,297	2,616	7,632	20,329	3,720	34.4
San Bernardino County	1,709,434	926,297	73,273	282,532	508,538	61,954	29.3	856,410	69,803	199,712	502,390	84,505	31.4
Red Mountain-Trona CCD	2,293	1,243	77	352	685	129	37.2	1,127	74	237	664	152	37.6
Three-County Region	2,389,024	1,303,478	102,311	393,207	717,614	90,346	na	1,187,857	97,433	277,162	691,666	121,596	na
CCDs in Study Area	**76,998**	**41,906**	**2,971**	**11,757**	**23,314**	**3,864**	na	**38,063**	**2,822**	**8,350**	**22,419**	**4,472**	na
Percents of Gender Total (except California median age)													
California	100.0%	53.6%	3.8%	14.0%	31.3%	4.5%	32.2	100.0%	7.1%	19.4%	61.2%	12.2%	34.4
Inyo County	100.0%	51.6%	2.7%	12.4%	28.1%	8.3%		100.0%	5.1%	18.3%	55.4%	21.2%	
Lone Pine CCD	100.0%	51.9%	3.3%	12.2%	27.7%	8.7%		100.0%	5.3%	19.1%	54.2%	21.3%	
Independence CCD	100.0%	50.2%	2.5%	10.9%	27.0%	9.8%		100.0%	4.7%	17.4%	53.9%	24.0%	
Kern County	100.0%	55.6%	4.3%	16.4%	30.8%	4.1%		100.0%	8.4%	23.5%	57.2%	10.9%	
East Kern CCD	100.0%	54.7%	3.9%	15.5%	30.5%	4.7%		100.0%	7.6%	22.3%	59.3%	10.8%	
San Bernardino County	100.0%	54.2%	4.3%	16.5%	29.7%	3.6%		100.0%	8.2%	23.3%	58.7%	9.9%	
Red Mountain-Trona CCD	100.0%	54.2%	3.4%	15.4%	29.9%	5.6%		100.0%	6.6%	21.0%	58.9%	13.5%	
Three-County Region	100.0%	54.6%	4.3%	16.5%	30.0%	3.8%		100.0%	8.2%	23.3%	58.2%	10.2%	
CCDs in Study Area	**100.0%**	**54.4%**	**3.9%**	**15.3%**	**30.3%**	**5.0%**		**100.0%**	**7.4%**	**21.9%**	**58.9%**	**11.7%**	

Source: United States Department of Commerce (2000a).

THIS PAGE INTENTIONALLY LEFT BLANK.

Table E-3 **Educational Attainment in Inyo, Kern, and San Bernardino Counties and CCDs in the Haiwee Geothermal Leasing Area SSA (2000 Census)***

	No schooling completed	8th grade and under	High School graduate	Degree	Bachelors Degree	Masters degree	school degree	Doctorate degree
California	3.2%	8.2%	20.1%	7.1%	17.1%	6.0%	2.3%	1.2%
Inyo County	0.4%	4.0%	31.3%	7.7%	10.5%	4.3%	1.8%	0.6%
Independence CCD	0.4%	2.8%	38.1%	8.2%	8.9%	2.3%	0.9%	0.6%
Lone Pine CCD	0.7%	7.3%	29.9%	6.6%	9.1%	3.8%	0.8%	0.5%
Kern County	4.4%	10.7%	25.4%	6.4%	9.1%	3.0%	1.0%	0.4%
East Kern CCD	1.3%	3.8%	25.2%	9.4%	11.2%	5.4%	0.8%	0.8%
Lake Isabella CCD	0.5%	5.0%	34.9%	6.2%	5.8%	1.7%	0.5%	0.2%
San Bernardino County	2.5%	7.9%	25.0%	7.6%	10.4%	3.6%	1.4%	0.6%
Red Mountain-Trona CCD	0.5%	4.0%	36.9%	5.1%	6.7%	2.3%	0.0%	0.0%
Three County Area	3.0%	8.6%	25.2%	7.2%	10.0%	3.4%	1.3%	0.5%
CCDs Total	**1.1%**	**4.1%**	**28.0%**	**8.5%**	**9.9%**	**4.5%**	**0.8%**	**0.6%**

*percent of population over 25 years old

Source: United States Department of Commerce (2000a).

Table E-4 1999 Income Distribution in the CCDs and Counties of the Haiwee SSA

		Individuals				Households					
	Per capita income in 1999	Total Below Poverty Line	and 1.5 Times Poverty Line	1.5-2.0 Times	2.0 and over	Under $20k	$20-40k	$40-$75k	$75-125k	$125-200k	$200k or more
California	$ 22,711	14.2%	9.9%	8.9%	66.9%	19.6%	22.7%	28.9%	18.3%	6.9%	3.6%
Inyo County	$ 19,639	12.6%	10.3%	10.4%	66.7%	29.7%	26.4%	27.6%	12.6%	2.9%	0.8%
Independence CCD	$ 18,894	10.4%	9.3%	10.7%	69.6%	26.8%	27.9%	30.9%	11.8%	2.4%	0.4%
Lone Pine CCD	$ 15,719	20.1%	12.7%	11.3%	55.9%	42.1%	27.2%	21.0%	7.9%	1.9%	0.0%
Kern County	$ 15,760	20.8%	13.7%	11.0%	54.5%	28.2%	27.1%	27.5%	13.0%	3.0%	1.2%
East Kern CCD	$ 19,149	13.9%	10.0%	9.6%	66.5%	22.9%	24.6%	31.4%	16.8%	3.5%	0.8%
Lake Isabella CCD	$ 15,897	20.0%	15.4%	13.9%	50.7%	43.1%	29.9%	18.1%	5.9%	1.7%	1.3%
San Bernardino County	$ 16,856	15.8%	11.1%	10.4%	62.6%	21.9%	25.2%	31.1%	16.1%	4.3%	1.3%
Red Mountain-Trona CCD	$ 17,001	18.9%	9.3%	10.1%	61.7%	27.3%	25.5%	35.8%	10.6%	0.8%	0.0%
Three Counties Combined	na	17.2%	11.8%	10.6%	60.5%	23.8%	25.8%	30.1%	15.2%	3.9%	1.3%
CCDs combined	na	15.1%	10.9%	10.4%	63.6%	27.7%	25.8%	28.6%	14.1%	3.0%	0.8%

Source: United States Department of Commerce (2000a).

APPENDIX F

Emissions

APPENDIX F

EMISSIONS

- Haiwee Construction Emissions
  - Construction Heavy Equipment Emissions
  - Fugitive Dust Emission Calculations
  - Construction Worker Commute Emission Calculations
  - Construction Truck Trip Emissions
  - Operational Vehicle Emission Calculations
- Haiwee Drill Rig Emissions

HAIWEE DRILL RIG EMISSIONS

THIS PAGE INTENTIONALLY LEFT BLANK.

Table F-1
Drilling Rig
Emissions Calculations - Tier 3 Drilling Rig
Haiwee Geothermal Leasing Area

Table 1: Emissions from Drilling Rig Engines for Initial Wells

Average Power Rating (hp)	500	Exploration	Operation
Fuel Type	Diesel	20 Number of Wells	12 Number of Wells
Total Operating Hours - Exploration	2400	24 Operating Hours per day/drill rig	24 Operating Hours per day/drill rig
Total Operating Hours - Initial Wells	17280	5 Drilling days per well	60 Drilling days per well
Load Factor	0.75		

	Tier 3 Emission Factors (grams/hp-hr)							No of Generators	Hrs Per Day	Total Hours
	CO	VOC	NOX	SOX	PM10	CO2	CH4			
Exploration	2.60E+00	1.50E-01	2.85	1.25E+00	1.50E-01	5.26E+02	3.86E-02	1	24	2400
Initial Well Drilling	2.60E+00	1.50E-01	2.85	1.25E+00	1.50E-01	5.26E+02	3.86E-02	1	24	17280
										lbs/day

	Emissions, lbs/hour								Emission, tons (total)							
	CO	VOC	NOX	SOX	PM10	PM2.5	CO2	CH4	CO	VOC	NOX	SOX	PM10	PM2.5	CO2	CH4
Exploration	2.15	0.12	2.36	1.03	0.12	0.12	435.00	0.03	2.58	0.15	2.83	1.24	0.15	0.15	522.00	0.04
Initial Well Drilling	2.15	0.12	2.36	1.03	0.12	0.12	435.00	0.03	18.57	1.07	20.36	8.91	1.07	1.06	3758.37	0.28
lbs/day	51.59	2.98	56.55	24.74	2.98	2.95	10439.91	0.77								

NOTE: NOx emissions from manufacturer/test data; CO, VOC, SOx, and PM10 emissions from EPA AP-42, Section 3.3 for diesel equipment.

THIS PAGE INTENTIONALLY LEFT BLANK.

CONSTRUCTION HEAVY EQUIPMENT EMISSIONS

THIS PAGE INTENTIONALLY LEFT BLANK.

Table F-2
Construction Heavy Equipment Emissions
Haiwee Geothermal Leasing Area

			Emission Factors														
Equipment	FUEL	HP	ROG (lb/hr)	CO (lb/hr)	NOX (lb/hr)	SOX (lb/hr)	PM10 (lb/hr)	PM2.5 (lb/hr)	CO2 (lb/hr)	CH4 (lb/hr)	N2O (lb/hr)	No of Equipment	Hrs Per Day	Days in Service	ROG lbs/day	CO lbs/day	NOX lbs/day
Exploration																	
Tracked Loader	DIESEL	108	0.1354	0.4732	0.8257	0.0008	0.0709	0.0631	65	0.0122	0.0784	1	8	180	1.08	3.79	6.61
Wheeled Loader	DIESEL	164	0.1312	0.6288	1.0135	0.0012	0.0583	0.0519	106	0.0118	0.0963	1	11	180	1.44	6.92	11.15
Motor Grader	DIESEL	174	0.1554	0.7363	1.1931	0.0014	0.0688	0.0612	124	0.0140	0.1133	3	8	180	3.73	17.67	28.63
Water Truck	DIESEL	189	0.1469	0.3944	1.3513	0.0019	0.0461	0.0410	167	0.0133	0.1284	1	8	180	1.18	3.16	10.81
Subtotal																	
															7.43	**31.53**	**57.20**
Wellfield Development																	
Tracked Loader	DIESEL	108	0.1354	0.4732	0.8257	0.0008	0.0709	0.0631	65	0.0122	0.0784	1	8	250	1.08	3.79	6.61
Wheeled Loader	DIESEL	164	0.1312	0.6288	1.0135	0.0012	0.0583	0.0519	106	0.0118	0.0963	1	11	250	1.44	6.92	11.15
Motor Grader	DIESEL	174	0.1554	0.7363	1.1931	0.0014	0.0688	0.0612	124	0.0140	0.1133	3	8	250	3.73	17.67	28.63
Water Truck	DIESEL	189	0.1469	0.3944	1.3513	0.0019	0.0461	0.0410	167	0.0133	0.1284	1	8	250	1.18	3.16	10.81
Subtotal																	
															7.43	**31.53**	**57.20**
Power Plant Construction																	
Tracked Loader	DIESEL	108	0.1354	0.4732	0.8257	0.0008	0.0709	0.0631	65	0.0122	0.0784	1	8	250	1.08	3.79	6.61
Wheeled Loader	DIESEL	164	0.1312	0.6288	1.0135	0.0012	0.0583	0.0519	106	0.0118	0.0963	1	11	250	1.44	6.92	11.15
Motor Grader	DIESEL	174	0.1554	0.7363	1.1931	0.0014	0.0688	0.0612	124	0.0140	0.1133	3	8	250	3.73	17.67	28.63
Roller Compactor	DIESEL	95	0.1054	0.4098	0.6619	0.0007	0.0574	0.0511	59	0.0095	0.0629	1	11	250	1.16	4.51	7.28
Crane	DIESEL	399	0.1635	0.5691	1.5327	0.0018	0.0571	0.0508	180	0.0148	0.1456	1	11	250	1.80	6.26	16.86
Truck Mounted Lift	DIESEL	60	0.0607	0.2451	0.4012	0.0004	0.0324	0.0288	38	0.0055	0.0381	1	8	250	0.49	1.96	3.21
Water Truck	DIESEL	189	0.1469	0.3944	1.3513	0.0019	0.0461	0.0410	167	0.0133	0.1284	1	11	250	1.62	4.34	14.86
Subtotal															**11.32**	**45.44**	**88.60**

Assumptions: SCAQMD Emission Factors, 2012
Horsepower ratings from URBEMIS defaults

THIS PAGE INTENTIONALLY LEFT BLANK.

Table F-2
Construction Heavy Equipment Emissions
Haiwee Geothermal Leasing Area

Equipment	Emissions SOX lbs/day	PM10 lbs/day	PM2.5 lbs/day	CO2 lbs/day	CH4 lbs/day	N2O lbs/day	Emission, tons (total) ROG tons (total)	CO tons (total)	NOX tons (total)	SOX tons (total)	PM10 tons (total)	PM2.5 tons (total)	CO2 tons (total)	CH4 tons (total)	N2O tons (total)
Exploration															
Tracked Loader	0.01	0.57	0.50	519.16	0.10	0.63	0.097	0.341	0.595	0.001	0.051	0.045	47	0.009	0.056
Wheeled Loader	0.01	0.64	0.57	1169.47	0.13	1.06	0.130	0.622	1.003	0.001	0.058	0.051	105	0.012	0.095
Motor Grader	0.03	1.65	1.47	2974.12	0.34	2.72	0.336	1.590	2.577	0.003	0.149	0.132	268	0.030	0.245
Water Truck	0.01	0.37	0.33	1332.36	0.11	1.03	0.106	0.284	0.973	0.001	0.033	0.030	120	0.010	0.092
Subtotal	**0.07**	**3.23**	**2.87**	**5995.11**	**0.67**	**5.43**	**0.67**	**2.84**	**5.15**	**0.01**	**0.29**	**0.26**	**539.56**	**0.06**	**0.49**
Wellfield Development															
Tracked Loader	0.01	0.57	0.50	519.16	0.10	0.63	0.135	0.473	0.826	0.001	0.071	0.063	65	0.012	0.078
Wheeled Loader	0.01	0.64	0.57	1169.47	0.13	1.06	0.180	0.865	1.394	0.002	0.080	0.071	146	0.016	0.132
Motor Grader	0.03	1.65	1.47	2974.12	0.34	2.72	0.466	2.209	3.579	0.004	0.206	0.184	372	0.042	0.340
Water Truck	0.01	0.37	0.33	1332.36	0.11	1.03	0.147	0.394	1.351	0.002	0.046	0.041	167	0.013	0.128
Subtotal	**0.07**	**3.23**	**2.87**	**5995.11**	**0.67**	**5.43**	**0.93**	**3.94**	**7.15**	**0.01**	**0.40**	**0.36**	**749.39**	**0.08**	**0.68**
Power Plant Construction															
Tracked Loader	0.01	0.57	0.50	519.16	0.10	0.63	0.135	0.473	0.826	0.001	0.071	0.063	65	0.012	0.078
Wheeled Loader	0.01	0.64	0.57	1169.47	0.13	1.06	0.180	0.865	1.394	0.002	0.080	0.071	146	0.016	0.132
Motor Grader	0.03	1.65	1.47	2974.12	0.34	2.72	0.466	2.209	3.579	0.004	0.206	0.184	372	0.042	0.340
Roller Compactor	0.01	0.63	0.56	648.88	0.10	0.69	0.145	0.563	0.910	0.001	0.079	0.070	81	0.013	0.086
Crane	0.02	0.63	0.56	1981.11	0.16	1.60	0.225	0.783	2.107	0.002	0.079	0.070	248	0.020	0.200
Truck Mounted Lift	0.00	0.26	0.23	304.57	0.04	0.30	0.061	0.245	0.401	0.000	0.032	0.029	38	0.005	0.038
Water Truck	0.02	0.51	0.45	1832.00	0.15	1.41	0.202	0.542	1.858	0.003	0.063	0.056	229	0.018	0.177
Subtotal	**0.10**	**4.88**	**4.35**	**9429**	**1.02**	**8.42**	**1.41**	**5.68**	**11.08**	**0.01**	**0.61**	**0.54**	**1179**	**0.13**	**1.05**
					2.36	**19.28**	**3.01**	**12.46**	**23.37**	**0.03**	**1.30**	**1.16**	**2238.60**	**0.25**	**2.01**

Assumptions: SCAQMD Emission Factors, 2012
Horsepower ratings from URBEMIS defaults

THIS PAGE INTENTIONALLY LEFT BLANK.

FUGITIVE DUST EMISSION CALCULATIONS

THIS PAGE INTENTIONALLY LEFT BLANK.

Fugitive Dust Emission Calculations
Haiwee Geothermal Leasing Area

Fugitive Dust Emissions by Activity

With watering 3 times daily
Control Efficiency: 61 percent

Grading	Total Area to be Disturbed	Maximum Daily Grading	Emission Factor, lbs PM10/acre/day	Emissions, lbs PM10/day	Emissions, lbs PM2.5/day	Emissions, lbs PM10/day	Emissions, lbs PM2.5/day
Exploration	62	6.2	20	124	26.04	48.36	10.1556
Wellfield Development	202	20.2	20	404	84.84	157.56	33.0876
Power Plant Construction	120	12	20	240	50.4	93.6	19.656

PM10 Emissions, tons/year	PM2.5 Emissions, tons/year
0.2418	0.050778
0.7878	0.165438
0.468	0.09828

Assume 10% of site to be graded per day.

THIS PAGE INTENTIONALLY LEFT BLANK.

Fugitive Dust Emission Calculations
Haiwee Geothermal Leasing Area

Fugitive Dust Emissions by Activity

With watering 3 times daily
Control Efficiency: 61 percent

Grading	Total Area to be Disturbed	Maximum Daily Grading	Emission Factor, lbs PM10/acre/day	Emissions, lbs PM10/day	Emissions, lbs PM2.5/day	Emissions, lbs PM10/day	Emissions, lbs PM2.5/day
Exploration	62	6.2	20	124	26.04	48.36	10.1556
Wellfield Development	202	20.2	20	404	84.84	157.56	33.0876
Power Plant Construction	120	12	20	240	50.4	93.6	19.656

PM10 Emissions, tons/year	PM2.5 Emissions, tons/year
0.2418	0.050778
0.7878	0.165438
0.468	0.09828

Assume 10% of site to be graded per day.

THIS PAGE INTENTIONALLY LEFT BLANK.

Table F-3

Fugitive Dust Emission Calculations

Haiwee Geothermal Leasing Area

Fugitive Dust Emissions by Activity

With watering 3 times daily

Control Efficiency: 61 percent

Grading	Total Area to be Disturbed	Maximum Daily Grading	Emission Factor, lbs PM10/acre/day	Emissions, lbs PM10/day	Emissions, lbs PM2.5/day	Emissions, lbs PM10/day	Emissions, lbs PM2.5/day
Exploration	62	6.2	20	124	26.04	48.36	10.1556
Wellfield Development	202	20.2	20	404	84.84	157.56	33.0876
Power Plant Construction	120	12	20	240	50.4	93.6	19.656

	PM10 Emissions, tons/year	PM2.5 Emissions, tons/year
Exploration	0.2418	0.050778
Wellfield Development	0.7878	0.165438
Power Plant Construction	0.468	0.09828

Assume 10% of site to be graded per day.

THIS PAGE INTENTIONALLY LEFT BLANK.

CONSTRUCTION WORKER COMMUTE EMISSION CALCULATIONS

THIS PAGE INTENTIONALLY LEFT BLANK.

Table F-2
Construction Heavy Equipment Emissions
Haiwee Geothermal Leasing Area

	Emissions						Emission, tons (total)								
Equipment	SOX lbs/day	PM10 lbs/day	PM2.5 lbs/day	CO2 lbs/day	CH4 lbs/day	N2O lbs/day	ROG tons (total)	CO tons (total)	NOX tons (total)	SOX tons (total)	PM10 tons (total)	PM2.5 tons (total)	CO2 tons (total)	CH4 tons (total)	N2O tons (total)
Exploration															
Tracked Loader	0.01	0.57	0.50	519.16	0.10	0.63	0.097	0.341	0.595	0.001	0.051	0.045	47	0.009	0.056
Wheeled Loader	0.01	0.64	0.57	1169.47	0.13	1.06	0.130	0.622	1.003	0.001	0.058	0.051	105	0.012	0.095
Motor Grader	0.03	1.65	1.47	2974.12	0.34	2.72	0.336	1.590	2.577	0.003	0.149	0.132	268	0.030	0.245
Water Truck	0.01	0.37	0.33	1332.36	0.11	1.03	0.106	0.284	0.973	0.001	0.033	0.030	120	0.010	0.092
Subtotal	**0.07**	**3.23**	**2.87**	**5995.11**	**0.67**	**5.43**	**0.67**	**2.84**	**5.15**	**0.01**	**0.29**	**0.26**	**539.56**	**0.06**	**0.49**
Wellfield Development															
Tracked Loader	0.01	0.57	0.50	519.16	0.10	0.63	0.135	0.473	0.826	0.001	0.071	0.063	65	0.012	0.078
Wheeled Loader	0.01	0.64	0.57	1169.47	0.13	1.06	0.180	0.865	1.394	0.002	0.080	0.071	146	0.016	0.132
Motor Grader	0.03	1.65	1.47	2974.12	0.34	2.72	0.466	2.209	3.579	0.004	0.206	0.184	372	0.042	0.340
Water Truck	0.01	0.37	0.33	1332.36	0.11	1.03	0.147	0.394	1.351	0.002	0.046	0.041	167	0.013	0.128
Subtotal	**0.07**	**3.23**	**2.87**	**5995.11**	**0.67**	**5.43**	**0.93**	**3.94**	**7.15**	**0.01**	**0.40**	**0.36**	**749.39**	**0.08**	**0.68**
Power Plant Construction															
Tracked Loader	0.01	0.57	0.50	519.16	0.10	0.63	0.135	0.473	0.826	0.001	0.071	0.063	65	0.012	0.078
Wheeled Loader	0.01	0.64	0.57	1169.47	0.13	1.06	0.180	0.865	1.394	0.002	0.080	0.071	146	0.016	0.132
Motor Grader	0.03	1.65	1.47	2974.12	0.34	2.72	0.466	2.209	3.579	0.004	0.206	0.184	372	0.042	0.340
Roller Compactor	0.01	0.63	0.56	648.88	0.10	0.69	0.145	0.563	0.910	0.001	0.079	0.070	81	0.013	0.086
Crane	0.02	0.63	0.56	1981.11	0.16	1.60	0.225	0.783	2.107	0.002	0.079	0.070	248	0.020	0.200
Truck Mounted Lift	0.00	0.26	0.23	304.57	0.04	0.30	0.061	0.245	0.401	0.000	0.032	0.029	38	0.005	0.038
Water Truck	0.02	0.51	0.45	1832.00	0.15	1.41	0.202	0.542	1.858	0.003	0.063	0.056	229	0.018	0.177
Subtotal	**0.10**	**4.88**	**4.35**	**9429**	**1.02**	**8.42**	**1.41**	**5.68**	**11.08**	**0.01**	**0.61**	**0.54**	**1179**	**0.13**	**1.05**
					2.36	**19.28**	**3.01**	**12.46**	**23.37**	**0.03**	**1.30**	**1.16**	**2238.60**	**0.25**	**2.01**

Assumptions: **SCAQMD Emission Factors, 2012**
Horsepower ratings from URBEMIS defaults

THIS PAGE INTENTIONALLY LEFT BLANK.

Table F-4
Construction Worker Commute Emission Calculations
Haiwee Geothermal Leasing Area

Construction Phase	Vehicle Class	No. of Workers Per Construction Phase	Speed (mph)	VMT (mi/vehicle-day)	CO Running Exhaust (g/mi)	CO Start-Up (g/start)[a]	NO_x Running Exhaust (g/mi)	NO_x Start-Up (g/start)[a]	ROG Running Exhaust (g/mi)	ROG Start-Up (g/start)[a]	ROG Hot-Soak (g/trip)	ROG Resting Loss (g/hr)	ROG Running Evaporative (g/mi)	ROG Diurnal Evaporative (g/hr)	SOx Running Exhaust (g/mi)	SOx Start-Up (g/start)[a]	PM10 Running Exhaust (g/mi)	PM10 Start-Up (g/start)[a]	PM10 Tire Wear (g/mi)	PM10 Brake Wear (g/mi)	PM2.5 Running Exhaust (g/mi)	PM2.5 Start-Up (g/start)[a]	PM2.5 Tire Wear (g/mi)	PM2.5 Brake Wear (g/mi)	C(Running Exhaust (g/mi)
Exploration	Light-Duty Auto	7	35	80	2.875	12.15	0.318	0.625	0.109	1.046	0.334	0.039	0.058	0.083	0.003	0.002	0.01	0.015	0.008	0.013	0.009	0.014	0.002	0.005	310.451
	Light-Duty Truck	3	35	80	7.009	20.759	0.827	0.867	0.29	1.602	0.542	0.068	0.121	0.137	0.004	0.002	0.016	0.019	0.008	0.013	0.014	0.017	0.002	0.005	384.226
Wellfield Development	Light-Duty Auto	100	35	80	2.875	12.15	0.318	0.625	0.109	1.046	0.334	0.039	0.058	0.083	0.003	0.002	0.01	0.015	0.008	0.013	0.009	0.014	0.002	0.005	310.451
	Light-Duty Truck	100	35	80	7.009	20.759	0.827	0.867	0.29	1.602	0.542	0.068	0.121	0.137	0.004	0.002	0.016	0.019	0.008	0.013	0.014	0.017	0.002	0.005	384.226
Power Plant Construction	Light-Duty Auto	100	35	80	2.875	12.15	0.318	0.625	0.109	1.046	0.334	0.039	0.058	0.083	0.003	0.002	0.01	0.015	0.008	0.013	0.009	0.014	0.002	0.005	310.451
	Light-Duty Truck	100	35	80	7.009	20.759	0.827	0.867	0.29	1.602	0.542	0.068	0.121	0.137	0.004	0.002	0.016	0.019	0.008	0.013	0.014	0.017	0.002	0.005	384.226

Paved Road Fugitive Dust
EPA's AP-42, Section 13.2.1, November 2006
E = k(sL/2)^0.65 x (W/3)^1.5 - C
For light-duty trucks assume 2 tons/vehicle
Assume silt loading for 10,000 ADT roadways = 0.03 g/m3
Assume k = 0.016 PM10
Assume 6 miles in addition for track-out for PM10
Emission Factors

PM10	9.81231E-05

Unpaved Road Fugitive Dust
EPA's AP-42, Section 13.2.2
Industrial Roads
E = k (s/12)^a x (W/3)^b
Assume 61% control efficiency for watering 3 x daily
For light-duty trucks assume 2 tons/vehicle
k = 1.5 for PM10, 0.15 for PM2.5
s = 8.5, a = 0.9, b = 0.45
Emission Factors

PM10	0.357378738
PM2.5	0.035737874

Emission Factors from EMFAC2007 Model, assuming 2012
Assume startup after 8 hours
Assume 45 minutes run time total

THIS PAGE INTENTIONALLY LEFT BLANK.

Table F-4
Construction Worker Commute Emission Calculations
Haiwee Geothermal Leasing Area

		)2	CH4		N2O		Emissions, lbs/day												Total Emissions, tons						
Construction Phase	Vehicle Class	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	CO	NOx	VOCs	SOx	PM10	PM2.5	Paved Road Fugitive Dust PM10	Paved Road Fugitive Oust PM2.5	CO2	CH4	N2O	Construction Days	CO	NOx	VOCs	SOx	PM10	PM2.5	Paved Road Fugitive Dust PM10
Exploration	Light-Outy Auto	164.917	0.026	0.06	0.03	0.06	3.92	0.41	0.23	0.00	0.04	0.02	0.05	0.01	388.37	0.03	0.04	180	0.35	0.04	0.02114	3.39E-04	0.00349	0.00182	0.00495
	Light-Outy Truck	194.251	0.048	0.093	0.08	0.08	3.98	0.45	0.23	0.00	0.02	0.01	0.02	0.00	205.87	0.03	0.04	180	0.36	0.04	0.02075	1.93E-04	0.00178	0.00102	0.00212
							7.91	**0.86**	**0.47**	**0.01**	**0.06**	**0.03**	**0.08**	**0.02**	**594.24**	**0.06**	**0.08**		**0.71**	**0.08**	**0.04**	**0.00**	**0.01**	**0.00**	**0.01**
Wellfield Development	Light-Outy Auto	164.917	0.026	0.06	0.03	0.06	56.06	5.88	3.36	0.05	0.55	0.29	0.78	0.16	5548.16	0.49	0.56	250	7.01	0.74	0.41943	6.72E-03	0.06917	0.03605	0.09812
	Light-Outy Truck	194.251	0.048	0.093	0.08	0.08	132.77	14.97	7.68	0.07	0.66	0.38	0.78	0.16	6862.27	0.89	1.42	250	16.60	1.87	0.96042	8.93E-03	0.08262	0.04723	0.09812
							188.84	**20.85**	**11.04**	**0.13**	**1.21**	**0.67**	**1.57**	**0.33**	**12410.44**	**1.37**	**1.98**		**23.60**	**2.61**	**1.38**	**0.02**	**0.15**	**0.08**	**0.20**
Power Plant Construction	Light-Outy Auto	164.917	0.026	0.06	0.03	0.06	56.06	5.88	3.36	0.05	0.55	0.29	0.78	0.16	5548.16	0.49	0.56	250	7.01	0.74	0.41943	6.72E-03	0.06917	0.03605	0.09812
	Light-Outy Truck	194.251	0.048	0.093	0.08	0.08	132.77	14.97	7.68	0.07	0.66	0.38	0.78	0.16	6862.27	0.89	1.42	250	16.60	1.87	0.96042	8.93E-03	0.08262	0.04723	0.09812
							188.84	**20.85**	**11.04**	**0.13**	**1.21**	**0.67**	**1.57**	**0.33**	**12410.44**	**1.37**	**1.98**		**23.60**	**2.61**	**1.38**	**0.02**	**0.15**	**0.08**	**0.20**

Paved Road Fugitive Oust
EPA's AP-42, Section 13.2.1, November 2006
E = k(sL/2)^0.65 x (W/3)^1.5 - C
For light-duty trucks assume 2 tons/vehicle
Assume silt loading for 10,000 AOT roadways = 0.03 g/m3
Assume k = 0.016 PM10
Assume 6 miles in addition for track-out for PM10
Emission Factors

PM10	9.81231E-05

Unpaved Road Fugitive Oust
EPA's AP-42, Section 13.2.2
Industrial Roads
E = k (s/12)^a x (W/3)^b
Assume 61% control efficiency for watering 3 x daily
For light-duty trucks assume 2 tons/vehicle
k = 1.5 for PM10, 0.15 for PM2.5
s = 8.5, a = 0.9, b = 0.45
Emission Factors

PM10	0.357378738
PM2.5	0.035737874

Emission Factors from EMFAC2007 Model, assuming 2012
Assume startup after 8 hours
Assume 45 minutes run time total

Table F-4
Construction Worker Commute Emission Calculations
Haiwee Geothermal Leasing Area

Construction Phase	Vehicle Class	Total Emissions, tons			
		Paved Road Fugitive Dust PM2.5	CO2	CH4	N2O
Exploration	Light-Duty Auto	0.00104	35	0.00306	0.00352
	Light-Duty Truck	0.00045	19	0.00240	0.00384
		0.00	**53.48**	**0.01**	**0.01**
Wellfield Development	Light-Duty Auto	0.02061	694	0.06063	0.06987
	Light-Duty Truck	0.02061	858	0.11095	0.17775
		0.04	**1551.30**	**0.17**	**0.25**
Power Plant Construction	Light-Duty Auto	0.02061	694	0.06063	0.06987
	Light-Duty Truck	0.02061	858	0.11095	0.17775
		0.04	**1551.30**	**0.17**	**0.25**

Paved Road Fugitive Dust
EPA's AP-42, Section 13.2.1, November 2006
E = k(sL/2)^0.65 x (W/3)^1.5 - C
For light-duty trucks assume 2 tons/vehicle
Assume silt loading for 10,000 ADT roadways = 0.03 g/m3
Assume k = 0.016 PM10
Assume 6 miles in addition for track-out for PM10
Emission Factors

PM10	9.81231E-05

Unpaved Road Fugitive Dust
EPA's AP-42, Section 13.2.2
Industrial Roads
E = k (s/12)^a x (W/3)^b
Assume 61% control efficiency for watering 3 x daily
For light-duty trucks assume 2 tons/vehicle
k = 1.5 for PM10, 0.15 for PM2.5
s = 8.5, a = 0.9, b = 0.45
Emission Factors

PM10	0.357378738
PM2.5	0.035737874

Emission Factors from EMFAC2007 Model, assuming 2012
Assume startup after 8 hours
Assume 45 minutes run time total

THIS PAGE INTENTIONALLY LEFT BLANK.

CONSTRUCTION TRUCK TRIP EMISSIONS

THIS PAGE INTENTIONALLY LEFT BLANK.

Table F-5
Construction Truck Trip Emissions
Haiwee Geothermal Leasing Area

Construction Phase	Vehicle Class	No. of Trucks per day	Speed (mph)	VMT (mi/vehicle-day)	CO Running Exhaust (g/mi)	NO_x Running Exhaust (g/mi)	ROG Running Exhaust (g/mi)	SOx Running Exhaust (g/mi)	PM10 Running Exhaust (g/mi)	PM10 Tire Wear (g/mi)	PM10 Brake Wear (g/mi)	PM2.5 Running Exhaust (g/mi)	PM2.5 Tire Wear (g/mi)	PM2.5 Brake Wear (g/mi)	CO2 Running Exhaust (g/mi)	CH4 Running Exhaust (g/mi)	N2O Running Exhaust (g/mi)	Emissions, lbs/day CO	NOx	VOCs	SOx	PM10
Exploration																						
Support Truck	Medium Duty Truck, Diesel	4	35	80	1.362	5.316	0.154	0.014	0.199	0.012	0.013	0.183	0.003	0.005	1505.00	0.007	0.51	0.96	3.75	0.11	0.01	0.16
Delivery Truck	Heavy Duty Truck, Diesel	1	35	80	3.883	13.537	0.769	0.017	0.434	0.036	0.028	0.399	0.009	0.012	1827.808	0.036	1.29	0.68	2.39	0.14	0.00	0.09
Wellfield Development																		**1.65**	**6.14**	**0.24**	**0.01**	**0.25**
Support Truck	Medium Duty Truck, Diesel	16	35	80	1.362	5.316	0.154	0.014	0.199	0.012	0.013	0.183	0.003	0.005	1505.00	0.007	0.51	3.84	15.00	0.43	0.04	0.63
Delivery Truck	Heavy Duty Truck, Diesel	3	35	80	3.883	13.537	0.769	0.017	0.434	0.036	0.028	0.399	0.009	0.012	1827.808	0.036	1.29	2.05	7.16	0.41	0.01	0.26
Power Plant Construction																		**5.90**	**22.16**	**0.84**	**0.05**	**0.90**
Support Truck	Medium Duty Truck, Diesel	8	35	80	1.362	5.316	0.154	0.014	0.199	0.012	0.013	0.183	0.003	0.005	1505.00	0.007	0.51	1.92	7.50	0.22	0.02	0.32
Delivery Truck	Heavy Duty Truck, Diesel	2	35	80	3.883	13.537	0.769	0.017	0.434	0.036	0.028	0.399	0.009	0.012	1827.808	0.036	1.29	1.37	4.78	0.27	0.01	0.18
																		3.29	**12.28**	**0.49**	**0.03**	**0.49**
Subtotal																						

Emission Factors from EMFAC2007 Model, assuming 2012 composite emission factors.
Assume startup after 8 hours
Assume 45 minutes run time total

Assume 45 minutes run time total
2012 Emission Factors from EMFAC2007,
average temp 60F; Great Basin

Paved Road Fugitive Dust
EPA's AP-42, Section 13.2.1, November 2006
E = k(sL/2)^0.65 x (W/3)^1.5 - C
For LDT assume 2 tons/vehicle, MDT assume 13 tons/vehicle, HDT assume 20 tons/vehicle
Assume silt loading for 10,000 ADT roadways = 0.03 g/m3
Assume k = 0.016 PM10
Assume 6 miles in addition for track-out for PM10
Emission Factors

PM10, LDT	9.81231E-05
PM10, MDT	0.008944829
PM10, HDT	0.017495628

Unpaved Road Fugitive Dust
EPA's AP-42, Section 13.2.2
Industrial Roads
E = k (s/12)^a x (W/3)^b

For LDT assume 2 tons/vehicle, MDT assume 13 tons/vehicle, HDT assume 20 tons/vehicle
k = 1.5 for PM10, 0.15 for PM2.5
s = 8.5, a = 0.9, b = 0.45
Assume 61% control efficiency for watering 3x daily
Emission Factors

PM10, LDT	0.357378738
PM10, MDT	0.829735596
PM10, HDT	1.007230136
PM2.5, LDT	0.035737874
PM2.5, MDT	0.08297356
PM2.5, HDT	0.100723014

Assume 6 miles each way of unpaved road travel

THIS PAGE INTENTIONALLY LEFT BLANK.

Table F-5
Construction Truck Trip Emissions
Haiwee Geothermal Leasing Area

		Emissions, lbs/day							Total Emissions, tons										
Construction Phase	Vehicle Class	PM2.5	Paved Road Fugitive Dust PM10	Paved Road Fugitive Dust PM2.5	CO2	CH4	N2O	Construction Days	CO	NOx	VOCs	SOx	PM10	PM2.5	Paved Road Fugitive Dust PM10	Paved Road Fugitive Dust PM2.5	CO2	CH4	CH4
Exploration																			
Support Truck	Medium Duty Truck, Diesel	0.13	5.60	1.18	1061.75	0.00	0.36	180	0.09	0.34	0.00978	8.89E-04	0.01422	0.01213	0.50387	0.10581	96	0.00044	0.03207
Delivery Truck	Heavy Duty Truck, Diesel	0.07	1.40	0.29	322.37	0.01	0.23	180	0.06	0.21	0.01221	2.70E-04	0.00790	0.00667	0.12597	0.02645	29	0.00057	0.02041
Wellfield Development		**0.21**	**7.00**	**1.47**	**1384.12**	**0.01**	**0.58**		**0.15**	**0.55**	**0.02**	**0.00**	**0.02**	**0.02**	**0.63**	**0.13**	**124.57**	**0.00**	**0.05**
Support Truck	Medium Duty Truck, Diesel	0.54	22.39	4.70	4247.01	0.02	1.43	270	0.52	2.03	0.05867	5.33E-03	0.08534	0.07276	3.02324	0.63488	573	0.00267	0.19239
Delivery Truck	Heavy Duty Truck, Diesel	0.22	4.20	0.88	967.12	0.02	0.68	270	0.28	0.97	0.05493	1.21E-03	0.03557	0.03000	0.56686	0.11904	131	0.00257	0.09186
Power Plant Construction		**0.76**	**26.59**	**5.58**	**5214.12**	**0.04**	**2.11**		**0.80**	**2.99**	**0.11**	**0.01**	**0.12**	**0.10**	**3.59**	**0.75**	**703.91**	**0.01**	**0.28**
Support Truck	Medium Duty Truck, Diesel	0.27	11.20	2.35	2123.50	0.01	0.71	270	0.26	1.01	0.02933	2.67E-03	0.04267	0.03638	1.51162	0.31744	287	0.00133	0.09620
Delivery Truck	Heavy Duty Truck, Diesel	0.15	2.80	0.59	644.74	0.01	0.45	270	0.18	0.64	0.03662	8.10E-04	0.02371	0.02000	0.37791	0.07936	87	0.00171	0.06124
		0.42	**14.00**	**2.94**	**2768.25**	**0.02**	**1.17**		**0.44**	**1.66**	**0.07**	**0.00**	**0.07**	**0.06**	**1.89**	**0.40**	**373.71**	**0.00**	**0.16**
Subtotal																			

Emission Factors from EMFAC2007 Model, assuming 2012 composite emission factors.
Assume startup after 8 hours
Assume 45 minutes run time total

Assume 45 minutes run time total
2012 Emission Factors from EMFAC2007,
average temp 60F, Great Basin

Paved Road Fugitive Dust
EPA's AP-42, Section 13.2.1, November 2006
E = k(sL/2)^0.65 x (W/3)^1.5 - C
For LDT assume 2 tons/vehicle, MDT assume 13 tons/vehicle, HDT assume 20 tons/vehicle
Assume silt loading for 10,000 ADT roadways = 0.03 g/m3
Assume k = 0.016 PM10
Assume 6 miles in addition for track-out for PM10

Emission Factors	
PM10, LDT	9.81231E-05
PM10, MDT	0.008944829
PM10, HDT	0.017495628

Unpaved Road Fugitive Dust
EPA's AP-42, Section 13.2.2
Industrial Roads
E = k (s/12)^a x (W/3)^b

For LDT assume 2 tons/vehicle, MDT assume 13 tons/vehicle, HDT assume 20 tons/vehicle
k = 1.5 for PM10, 0.15 for PM2.5
s = 8.5, a = 0.9, b = 0.45
Assume 61% control efficiency for watering 3x daily

Emission Factors	
PM10, LDT	0.357378738
PM10, MDT	0.829735596
PM10, HDT	1.007230136
PM2.5, LDT	0.035737874
PM2.5, MDT	0.08297356
PM2.5, HDT	0.100723014

Assume 6 miles each way of unpaved road travel

THIS PAGE INTENTIONALLY LEFT BLANK.

OPERATIONAL VEHICLE EMISSION CALCULATIONS

THIS PAGE INTENTIONALLY LEFT BLANK.

Table F-6
Operational Vehicle Emission Calculations
Haiwee Geothermal Leasing Area

		No. of Workers	Speed	VMT	CO		NOx		ROG						SOx		PM10				PM2.5				CO2	
Operations	Vehicle Class	Per Construction Phase	(mph)	(mi/vehicle-day)	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Hot-Soak (g/trip)	Resting Loss (g/hr)	Running Evaporative (g/mi)	Diurnal Evaporative (g/hr)	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Tire Wear (g/mi)	Brake Wear (g/mi)	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Tire Wear (g/mi)	Brake Wear (g/mi)	Running Exhaust (g/mi)	Start-Up (g/start)[a]
Workers	Light-Duty Auto	60	35	80	2.875	12.15	0.318	0.625	0.109	1.046	0.334	0.039	0.058	0.083	0.003	0.002	0.01	0.015	0.008	0.013	0.009	0.014	0.002	0.005	310.451	164.917
	Light-Duty Truck	25	35	80	7.009	20.759	0.827	0.867	0.29	1.602	0.542	0.068	0.121	0.137	0.004	0.002	0.016	0.019	0.008	0.013	0.014	0.017	0.002	0.005	384.226	194.251

Paved Road Fugitive Dust
EPA's AP-42, Section 13.2.1, November 2006
E = k(sL/2)^0.65 x (W/3)^1.5 - C
For light-duty trucks assume 2 tons/vehicle
Assume silt loading for 10,000 AOT roadways = 0.03 g/m3
Assume k = 0.016 PM10
Assume 6 miles in addition for track-out for PM10
Emission Factors
PM10 9.81231E-05

Unpaved Road Fugitive Oust
EPA's AP-42, Section 13.2.2
Industnal Roads
E = k (s/12)^a x (W/3)^b
Assume 61% control efficiency for watering 3 x daily
For light-duty trucks assume 2 tons/vehicle
k = 1.5 for PM10, 0.15 for PM2.5
s = 8.5, a = 0.9, b = 0.45
Emission Factors
PM10 0.357378738
PM2.5 0.035737874

Emission Factors from EMFAC2007 Model, assuming 2012
composite emission factors.
Assume startup after 8 hours
Assume 45 minutes run time total

THIS PAGE INTENTIONALLY LEFT BLANK.

Table F-6
Operational Vehicle Emission Calculations
Haiwee Geothermal Leasing Area

Operations	Vehicle Class	CH4		N2O		Emissions, lbs/day										
		Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	CO	NOx	VOCs	SOx	PM10	PM2.5	Paved Road Fugitive Dust PM10	Paved Road Fugitive Dust PM2.5	CO2	CH4	N2O
Workers	Light-Duty Auto	0.026	0.06	0.03	0.06	33.64	3.53	2.01	0.03	0.33	0.17	0.47	0.10	3328.90	0.29	0.34
	Light-Duty Truck	0.048	0.093	0.08	0.08	33.19	3.74	1.92	0.02	0.17	0.09	0.20	0.04	1715.57	0.22	0.36
						66.83	7.27	3.93	0.05	0.50	0.27	0.67	0.14	5044.47	0.51	0.69

Operations	Vehicle Class	Work Days	Total Emissions, tons										
			CO	NOx	VOCs	SOx	PM10	PM2.5	Paved Road Fugitive Dust PM10	Paved Road Fugitive Dust PM2.5	CO2	CH4	N2O
Workers	Light-Duty Auto	250	4.20	0.44	0.25166	4.03E-03	0.04150	0.02163	0.05887	0.01236	416	0.03638	0.04192
	Light-Duty Truck	250	4.15	0.47	0.24011	2.23E-03	0.02065	0.01181	0.02453	0.00515	214	0.02774	0.04444
			8.35	0.91	0.49	0.01	0.06	0.03	0.08	0.02	630.56	0.06	0.09

Paved Road Fugitive Dust
EPA's AP-42, Section 13.2.1, November 2006
E = k(sL/2)^0.65 x (W/3)^1.5 - C
For light-duty trucks assume 2 tons/vehicle
Assume silt loading for 10,000 ADT roadways = 0.03 g/m3
Assume k = 0.016 PM10
Assume 6 miles in addition for track-out for PM10
Emission Factors
PM10 9.81231E-05

Unpaved Road Fugitive Dust
EPA's AP-42, Section 13.2.2
Industrial Roads
E = k (s/12)^a x (W/3)^b
Assume 61% control efficiency for watering 3 x daily
For light-duty trucks assume 2 tons/vehicle
k = 1.5 for PM10, 0.15 for PM2.5
s = 8.5, a = 0.9, b = 0.45
Emission Factors
PM10 0.357378738
PM2.5 0.035737874

Emission Factors from EMFAC2007 Model, assuming 2012 composite emission factors.
Assume startup after 8 hours
Assume 45 minutes run time total

THIS PAGE INTENTIONALLY LEFT BLANK.

APPENDIX G

Numerical Groundwater Flow Modeling

APPENDIX G
NUMERICAL GROUNDWATER FLOW MODELING
ROSE VALLEY, INYO, COUNTY, CALIFORNIA

Prepared by

Daniel W. Matthews, R.G.

For POWER Engineers, Inc.

On Behalf of
U.S. Bureau of Land Management

February 2010

APPENDIX G

NUMERICAL GROUNDWATER FLOW MODELING ROSE VALLEY, INYO, COUNTY, CALIFORNIA

G1. INTRODUCTION

This appendix describes the numerical groundwater flow model used to evaluate potential impacts of groundwater extraction from the uppermost groundwater-bearing zone in the Rose Valley, California, groundwater basin for the Geothermal Leasing Environmental Impact Statement (EIS) being prepared by Power Engineers on behalf of the U.S. Bureau of Land Management (BLM). For this project, GEOLOGICA Inc. (GEOLOGICA) revised and recalibrated a numerical model previously developed by GEOLOGICA (2008) for the Rose Valley groundwater basin. Groundwater flow evaluations were conducted using the U.S.G.S. MODFLOW computer code (McDonald and Harbaugh, 1988) implemented in the Groundwater Vistas graphical environment (Environmental Simulations, 2007).

G1.1. Purpose

The purpose of the evaluations and analysis described in this appendix were: to evaluate the groundwater conditions; and to analyze the potential impacts to groundwater resources in Rose Valley that might develop as a result of geothermal exploration, well, well field, and power plant construction, and well field and power plant operation and maintenance.

G1.2. Scope

The scope of this task included evaluating information regarding hydrogeologic conditions in Rose Valley, revising an existing numerical groundwater flow model of Rose Valley developed by GEOLOGICA (2008) to better represent those conditions, calibrating the model to new monitoring data collected by Inyo County between November 2007 and November 2009, and developing scenarios to forecast the potential impacts of alternatives to the proposed project. In addition, GEOLOGICA conducted sensitivity analyses to evaluate the impact of uncertainty in various input parameters on model predictions.

G2. ENVIRONMENTAL SETTING

Sections below describe the environmental setting of the study area including physiography, geology, hydrogeology, surface water, and concludes with an evaluation of the water budget for Rose Valley.

G2.1. Physiography

Rose Valley is a long, narrow valley located on the eastern flank of the Sierra Nevada Mountains in Inyo County, California. The alluvial portion of the groundwater basin is approximately 16 miles long from the southern end of the Haiwee Reservoir to just south of Little Lake, and has a maximum width of approximately 6 miles at its widest point.

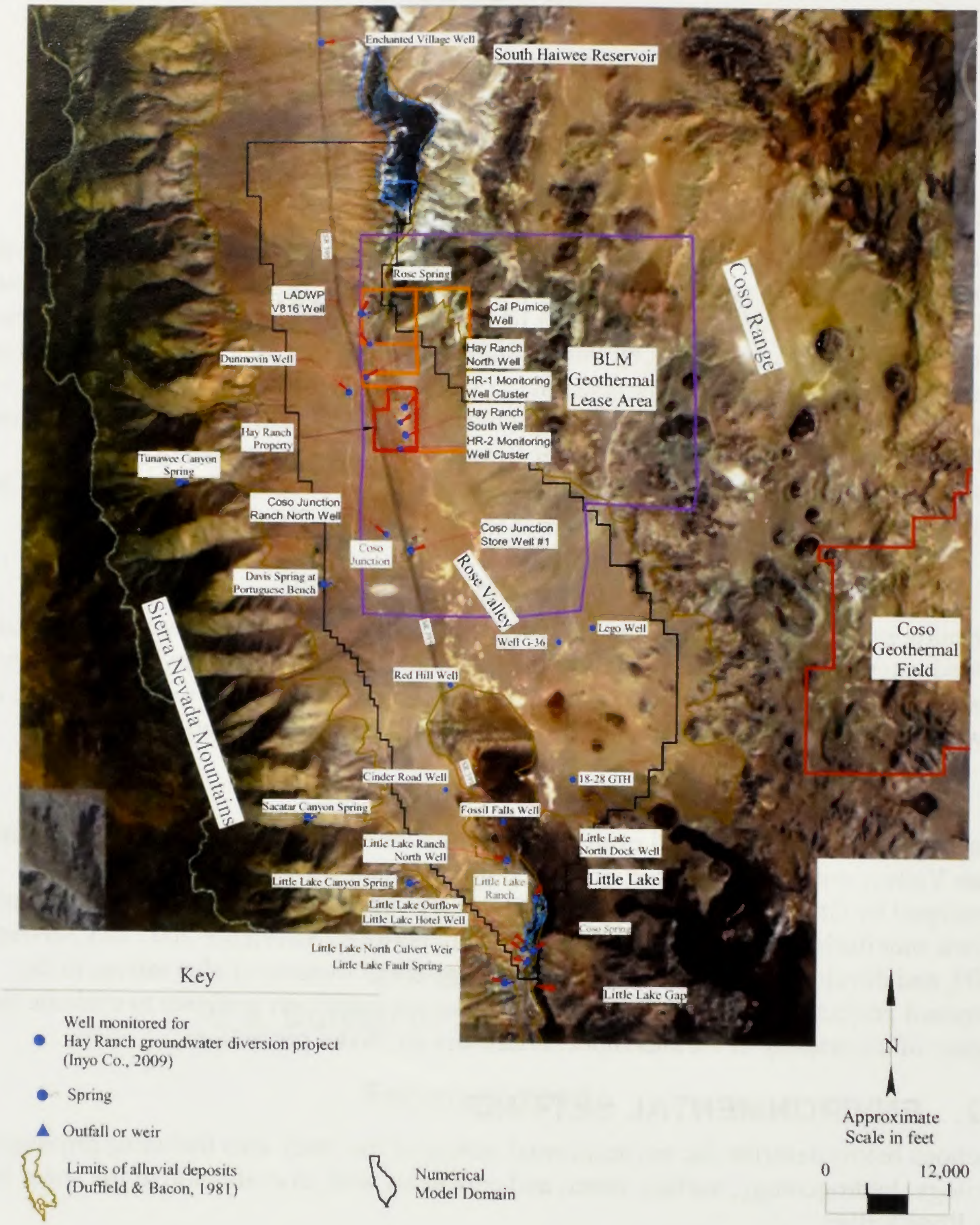


Figure G-1: Physiographic Features of Rose Valley

Rose Valley is topographically separated from the Owens Valley to the north by Dunmovin Hill, a topographic high that is composed of a massive landslide or series of debris flow deposits that originated from the Sierra Nevada range to the west (Bauer, 2002). Rose Valley is separated from the Indian Wells Valley to the south by a topographic high formed by a combination of granitic rocks and volcanic flows, and by the Little Lake Gap, which is an approximately 1,000 ft wide water-carved canyon within the volcanics (Bauer, 2002). **Figure**

G-1 depicts relevant physiographic features of the study area. The ground surface of the valley floor generally slopes gently to the south at a rate of approximately 30 to 35 feet per mile.

G2.2. Geology

Rose Valley is a graben surrounded and underlain by igneous and metamorphic basement rocks of the Sierra Nevada and Coso Ranges. Alluvial sediments were encountered to depths as great as 3,489 feet in borings advanced in the north central portion of the basin (Schaer, 1981) and may extend to depths greater than 5,000 feet below ground surface (bgs) based on gravity surveys (GeoTrans, 2004). Younger (30 to 0.4 million years old) volcanic rocks of the Coso Range outcrop east of the central and northern Rose Valley and are predominately rhyolitic, dacitic, and andesitic in composition. The southern boundary of the Rose Valley groundwater basin is marked by outcrops of volcanic rocks related to eruptions within or flows from the Coso Range and volcanic cinder cones in the Red Hill area. **Figure G-2** provides a geologic map of the study area.

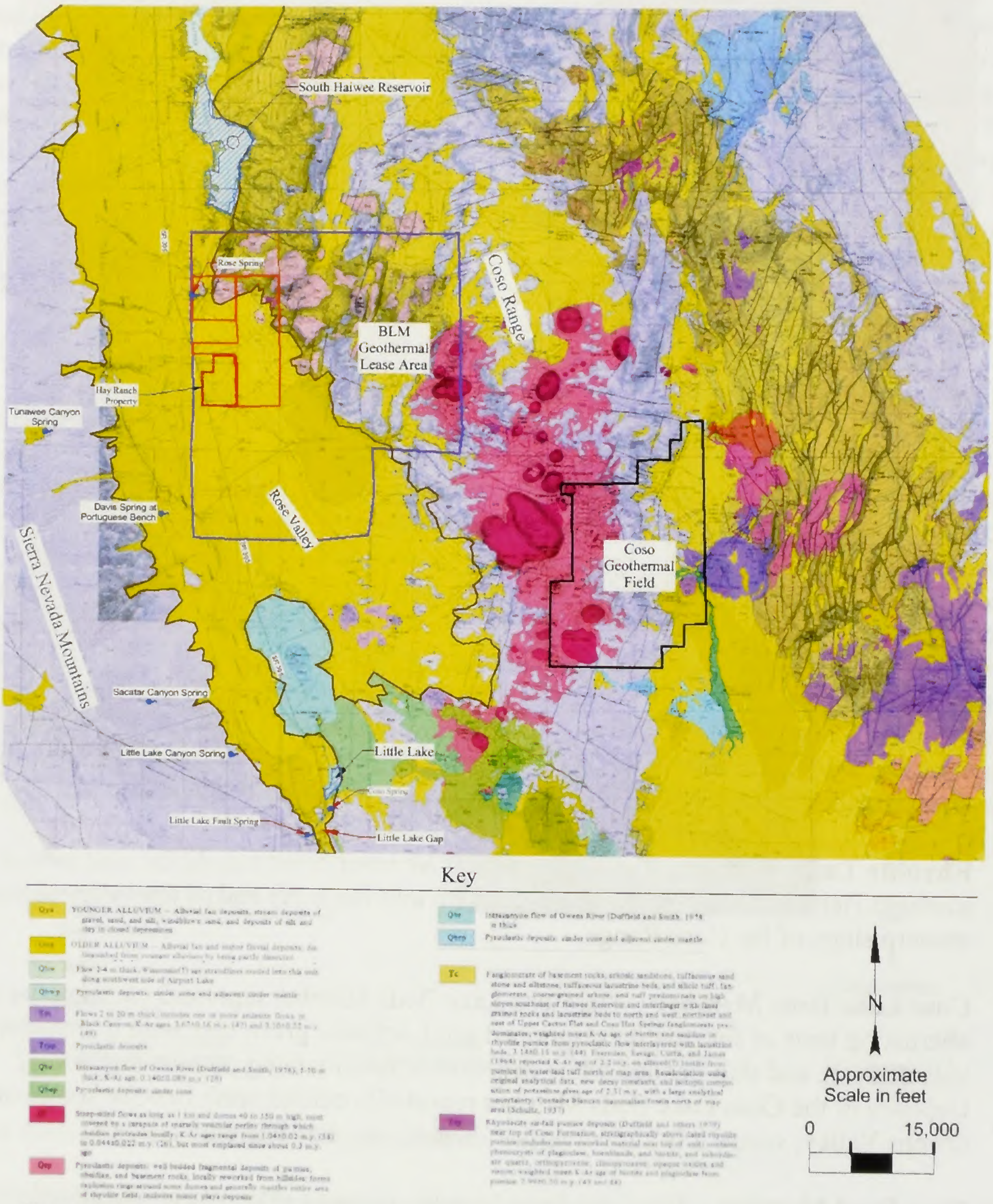
As summarized by Bauer (2002), the basin fill consists, in descending order, of recent alluvial fan deposits including debris flows from the bordering Sierra Nevada Mountains, volcanic deposits including basalt, ash, cinders, and tuff, lacustrine deposits of the Coso Formation, and older alluvial fan deposits from the Sierra Nevada and Coso Ranges. The recent alluvial deposits usually occur between ground surface and depths of up to 800 ft, and consist of a mixture of sands and gravels interbedded with clay. The maximum drilled thickness of these deposits occurs in the north central part of the valley near the Hay Ranch property. The Coso Formation uncomformably overlies basement rocks in the Coso Range and Rose Valley, and is comprised of a heterogeneous assemblage of primarily lacustrine deposits, with lesser amounts of volcanic tuff and alluvial fan deposits. Bauer (2002) described the Coso Formation as being comprised of four members in descending stratigraphic order: the Rhyolite Tuff Member, the Coso Lake Beds Member, the Coso Sand Member, and the Basal Fanglomerate Member.

- **Rhyolite Tuff Member** – The Rhyolite Tuff Member occurs along the east side of the southern Haiwee Reservoir and extends south into the north end of the valley along the western slope of the Coso Range.

- **Coso Lake Beds Member** – The Coso Lake Beds Member reportedly is composed of alternating beds of fine to-coarse-grained sand, arkosic, green clay with interspersed volcanic ash, and thin-bedded white rhyolitic tuffs containing pumice fragments. Deposits of the Coso Lake Beds Member reportedly extend north into the southern Owens Valley, where it is known as the Owens Lake Bed Member.

- **Coso Sand Member** – The Coso Sand Member consists of poorly consolidated, fine-to-coarse grained alluvial gravels, sand, and red clay beds derived from the granitic basement rocks of the Coso Range and reworked Sierra Nevada alluvial fan materials. The Coso Sand Member occurs at depths from 1,500 ft to 3,000 ft bgs and the unit is thickest to the west, decreasing in thickness rapidly to the east.

- **Basal Fanglomerate Member** – The Basal Fanglomerate Member was infrequently encountered in well borings drilled in the valley. It consists of reworked colluvial deposits localized by basement topography and structures.



*Basemap and key from
Geologic Map of the Coso Volcanic Field and Adjacent Areas, Inyo County, California by Wendell A. Duffield and Charles R. Bacon. 1981

Geologic Map

Figure G-2: Geologic Map

Coso Operating Company (COC) recently completed two sets of clustered multi-level monitoring wells to depths of up to 605 feet (ft) below ground surface (bgs) on the Hay

Ranch property (SGSI, 2009a; 2009b; and 2009c). The lithology encountered during drilling was described as alluvium consisting of fine to coarse sand with gravel to 20 ft bgs, which is underlain by fluvial-type deposits containing silt, fine to coarse sand, cobbles, and boulders down to 200 feet bgs. Below 200 feet bgs SGSI reported encountering lacustrine-type deposits containing fine to coarse sand, numerous silt and clay interbeds, and occasional gravel interbeds to a total depth of 570 feet bgs. At depths of approximately 308 to 336 feet bgs and 464 to 478 feet bgs, two significant swelling clay units were encountered in the HR-1 and HR-2 well clusters which were confirmed by geophysical logging. The lithology observed in HR-1 and HR-2 is not inconsistent with the existing model construction.

G2.3. Hydrogeology

G2.3.1. Hydrostratigraphic Units

The principal hydrostratigraphic units that comprise the Rose Valley aquifer consist of recent alluvial deposits, and the Coso Lake Bed and Coso Sand Members of the Coso Formation. Older bedrock is largely impermeable or low permeability and typically impedes or excludes groundwater flow.

SGSI (2009c) concluded that the uppermost groundwater-bearing unit in Rose Valley, which occurs within the upper 600 ft of the sediment column is separated into three aquifer-zones (upper, intermediate, and deep) as a result of the presence of low permeability clay horizons encountered at depths of approximately 325 ft and 475 ft bgs in the HR-1 well cluster and approximately 30 ft deeper in the HR-2 well cluster and south Hay Ranch production well. The horizontal extent of the clay horizons cannot be determined with available information.

G2.3.2. Groundwater Occurrence and Flow

The groundwater table is typically first encountered during drilling within the upper portion of the recent alluvial deposits. Depth to groundwater ranges from 140 to 240 ft bgs in the north and central parts of Rose Valley, decreases to approximately 40 ft bgs at the northern end of the Little Lake Ranch, and surfaces near the south end of the Little Lake Ranch property. Because the ground surface slopes more steeply to the south than the groundwater table, the groundwater table surfaces at and discharges from springs beneath Little Lake, sustaining the lake and the surface water discharge from Coso Spring immediately to the south of the lake. At the south end of Rose Valley, groundwater flow through the Little Lake Gap is constrained by bedrock on the west, an apparent subsurface bedrock rise below, and low or reduced permeability in the basalt lava flows to the east.

Groundwater elevation data obtained from the Inyo County for the Hay Ranch Monitoring Project (Inyo Co. 2009, 2010) were used to develop a groundwater elevation contour map for November 2009 (**Figure G-3**). Groundwater elevation data used to develop the contour map are tabulated in **Table G-1**. The November 2009 groundwater elevation contour map of Rose Valley indicated southeasterly groundwater flow along the axis of the northwest to southeast trending valley.

Table G-1: Rose Valley Groundwater Elevation Data

	Groundwater Elevation, ft amsl	
Well	November 2007(1)	November 2009(2)
Enchanted Village	NM	3,755.5
LADWP 816	3435.2	3,438
Dunmovin	NM	3,253.0
Cal Pumice	3266	3,265.4
Hay Ranch North	3,245	3,245.3
HR-1A	NM	3,244.3
HR-1B	NM	3,243.1
HR-1C	NM	3,245.6
HR-2A	NM	3,241.1
HR-2B	NM	3,238.5
HR-2C	NM	3,242.6
Hay Ranch South	3,240.90	3,241.8
Coso Junction Ranch	3232.7	3,232.2
Coso Junction Store #1	3229.3	3,229.8
Red Hill	NM	3,200.8
Lego	3200.5	3,200.6
G-36	3199.6	3,200.0
Cinder Road	NM	3,187.0
18-28 GTH	3188.2	3,188.5
Fossil Falls	NM	3,175.6
Little Lake Ranch North	3158.95	3,158.9
Little Lake Ranch Dock	NM	3,147.9
Little Lake Surface	NM	3,147.4
Little Lake Ranch Hotel	NM	3,138.3

<u>Notes:</u>

(1) MHA (2008).

(2) Average November 2009 groundwater elevation estimated by Geologica from groundwater elevation hydrographs presented at the Inyo County Water Department's Hay Ranch Monitoring Website, http://www.inyowater.org/coso/default.html accessed December 4, 2009.

** See Figure G-3 for well locations.

NM = Not measured.

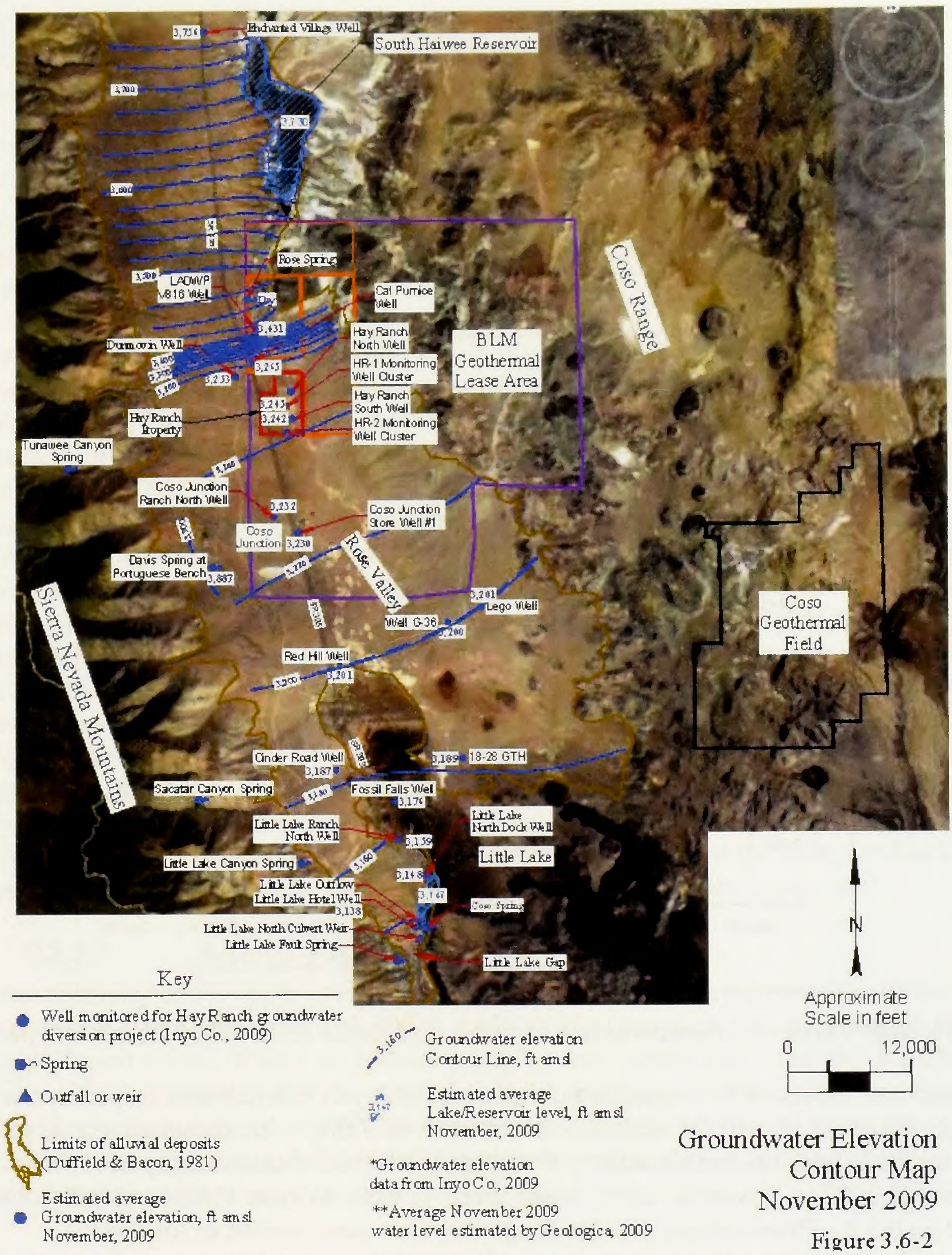
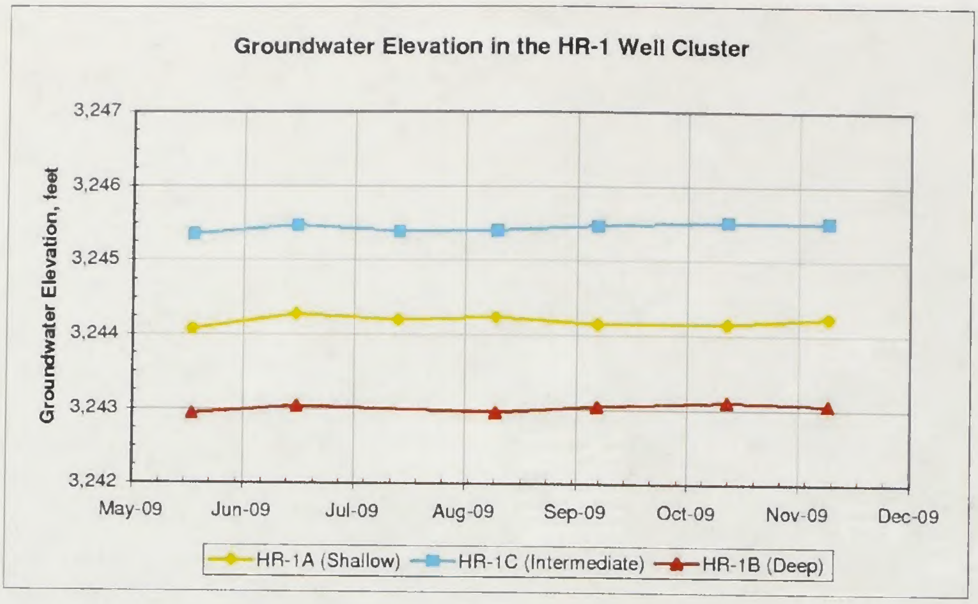


Figure G-3: November 2009 Groundwater Elevation Contour Map

Water level measurements in the clustered multi-level wells (HR-1A, HR-1B, and HR-1C and HR-2A, HR-2B, and HR-2C) advanced on the Hay Ranch property in the north central part of the valley indicated the presence of groundwater elevation differences that suggest generally downward hydraulic gradients overall but with higher potentiometric elevations in the intermediate groundwater-bearing zone compared to the upper and deep groundwater-bearing zones (see **Figure G-4**).



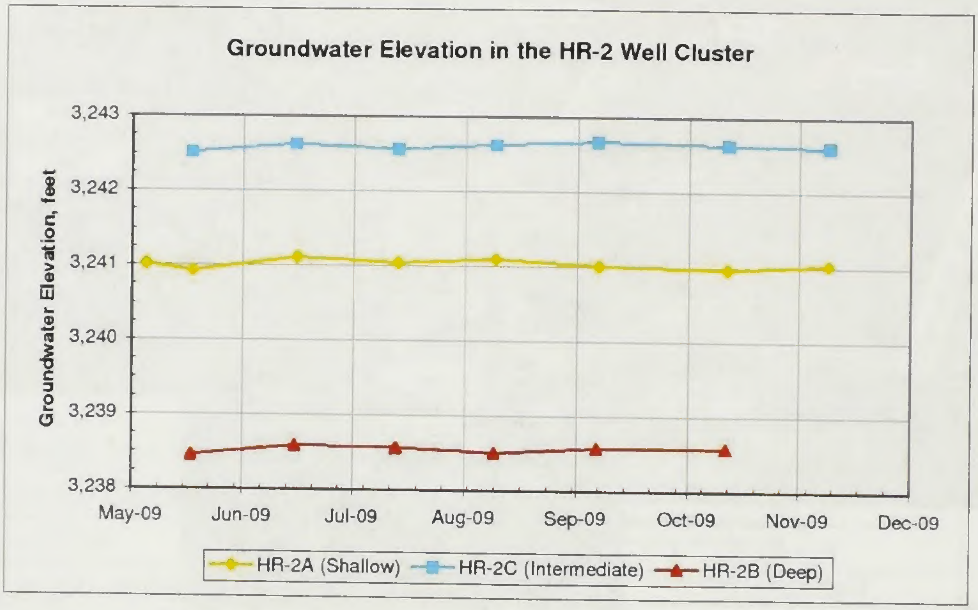


Figure G-4: Vertical Groundwater Elevation Gradients on the Hay Ranch Property

Groundwater elevation hydrographs published at the Inyo County Water Department's website (Inyo Co., 2010) for wells monitored in Rose Valley were reviewed to evaluate long-term trends in groundwater elevation. Over the 2-year model calibration period from November 2007 to November 2009, water levels in wells in Rose Valley generally changed less than 0.5 ft. Observations over the longer term are summarized as follows:

- The LADWP 816 well located at the north end of Rose Valley shows fluctuations of up to 5 ft between January 1995 and January 2010 with a relatively steady average level of approximately 3,438 ft.
- The Pumice Mine well (aka Cal Pumice) generally shows small fluctuations of up to 1 to 2 ft with a relatively steady average level of approximately 3,265.5 ft, except for a sudden unexplained 5 ft drop in December 2009.

- Water level monitoring data for the Hay Ranch North production well, Hay Ranch South production well, and Coso Ranch North well, Coso Junction Store #1 well between January 2003 and January 2010 indicate a generally upward trend of 1-1/2 to 2 ft.
- Rising water level trends of 1 to 1-1/2 ft were also observed in the Lego and G-36 wells on Navy property approximately 3-1/2 miles southeast of Coso Junction.
- Long term monitoring data were not available for the wells near the south end of the valley (Cinder Road, Red Hill, or Fossil Falls) or the wells on the Little Lake Ranch property.

The groundwater levels in the LADWP wells 2 miles south of the Haiwee Reservoir were consistently approximately 170 ft higher than groundwater levels in the closest monitored well to the south, Cal-Pumice, throughout the long term monitoring period, consistent with a surface water flow component or input from a groundwater basin at a different groundwater elevation potential (i.e., Owens Valley), and, the presence of a lower permeability zone between the LADWP property and the remainder of the valley. Groundwater levels in the LADWP wells were more variable than any other wells in the valley. The source of this variation is unknown. Water levels in Haiwee Reservoir and the flow rate in the LADWP aqueduct rose during the time water levels were monitored for the 2007 pumping test while groundwater levels in the LADWP wells fell; positive correlation between rising reservoir levels and groundwater elevation would be expected if seepage from the reservoir strongly influenced groundwater levels. The absence of correlation between reservoir levels and groundwater levels in the LADWP wells suggests varying rates of groundwater influx from Owens Valley may be the cause of groundwater level fluctuations at the north end of Rose Valley. The cause of the apparent rising water level trend in the central part of the valley is unknown but could reflect changes in recharge along the margins of the valley and/or long term recovery from agricultural pumping on the Hay Ranch property in the 1970's.

G2.3.3. Aquifer Properties

The transmissivity of the upper portion of the alluvial deposits was previously estimated to range from 9,000 to 69,800 gpd/ft (1,200 to 9,330 ft^2/day) based on data presented in the Rockwell Report (1980). Based on 24-hour pumping tests conducted in the Hay Ranch wells, GeoTrans (2003) concluded that the transmissivity of the Rose Valley aquifer near Hay Ranch was approximately 10,000 ft^2/day and estimated that the horizontal hydraulic conductivity was approximately 20 ft/day. GeoTrans concluded that they had insufficient data to estimate aquifer storage properties.

Based on a 14-day pumping test conducted in the southern production well on the Hay Ranch property and monitored in wells throughout the valley, GEOLOGICA (2008) estimated the transmissivity and horizontal hydraulic conductivity of the aquifer were approximately 14,750 ft^2/day and 24 ft/day, respectively. The vertical hydraulic conductivity of the alluvial aquifer in central Rose Valley was estimated to be 0.01 ft/day using a Neuman "Beta" coefficient of 0.01 from the aquifer testing type curve match and an aquifer thickness of 600 ft. The storage coefficient applicable to early time response and saturated soil below the water table was found to be 0.001.

The City of Los Angeles Department of Water & Power (LADWP) conducted a short-term pumping test on property they own at the north end of Rose Valley in the spring of 2009 (LADWP, 2009). Well V817 was pumped at a rate of 1.84 cubic feet per second (cfs) for 6.5 days. The pumping test resulted in 270 feet of drawdown in the pumping well, 48 feet of drawdown in monitoring well V816 located 197 feet west of the pumping well, and no drawdown in other nearby wells. LADWP concluded that the observed response indicated a small zone of influence and a deep cone of depression. LADWP estimated an average transmissivity of 1,340 ft^2/day and a storage coefficient of 0.004 using pumping test data for the aquifer near well V817.

G2.4. Surface Water

The average annual precipitation in Rose Valley ranges from 5 to 7 inches while the area's annual evapotransporation rate is estimated to be on the order of 65 inches (CWRCB, 1993). Consequently, surface water bodies in the Rose Valley area consist of perennial springs sustained by groundwater flow, ephemeral streams and washes that mainly flow in the winter, and a groundwater-fed lake (Little Lake) and nearby ponds. Surface water features of interest are shown on **Figure G-1** and discussed below.

G2.4.1. Haiwee Reservoir

The South Haiwee Reservoir is located at the north end of Rose Valley approximately 6 miles north of Coso Junction, CA. The crest of the south Haiwee Dam is located at an elevation of approximately 3,766 ft MSL. Because of seismic stability concerns, the water level in the reservoir is currently limited to a maximum elevation 3,742 ft MSL. During construction of the dam, a trench was reportedly excavated to a depth of up to 120 ft below ground surface, until it tagged basalt bedrock, and backfilled with clay to seal the base of the dam (LADPS, 1916); however, the remainder of the reservoir is unlined. Weiss (1979) estimated that underflow from Haiwee Reservoir contributed approximately 600 acre-ft of water per year to the Rose Valley groundwater basin.

G2.4.2. Springs

Several springs are located in or near Rose Valley as follows:

- **Rose Spring** – Rose Spring is reportedly (USGS Topographic Map) located in the Haiwee Geothermal Leasing Area approximately two miles south and west of the South Haiwee Reservoir at an elevation of approximately 3,640 feet amsl. A table of spring discharge data presented in Rockwell (1980) indicated that the spring was flowing in November 1975 but did not list discharge rates data for the spring. While the Rose Spring was reportedly sampled by the USGS in the early 1970's, no discharge has been observed from the spring in recent years. During a biological reconnaissance survey conducted on April 5, 2008, no surface water was observed. A concrete storage structure lies below the spring; however, water pipes that once fed the structure are no longer functioning (MHA 2008). When flowing, the spring apparently drains shallow groundwater in alluvial sediments south of the reservoir. Due to its higher elevation and lack of discharge, the Rose Spring is not believed to be directly connected to the Rose Valley groundwater aquifer system.

- **Tunawee Canyon Spring** – Tunawee Canyon Spring is located in Tunawee Canyon approximately four miles northwest of the town of Coso Junction at approximately 5,200 feet amsl. Several springs are identified in the upper reaches of Tunawee Canyon on the USGS topographic map of the area. Tunawee Canyon Spring is likely sustained by high elevation precipitation infiltration in the Sierra Nevada Mountains to the west. Rockwell (1980) reported discharge rates of 1.6 to 15 gallons per minute (2.6 to 24 acre-feet/yr) from the spring in November 1975.

- **Davis Spring** – The Davis Spring is located on the Davis Ranch, approximately two miles west of Coso Junction. The Davis Spring is located on the west central side of Rose Valley at Portuguese Bench at an elevation of approximately 3,870 feet amsl. The estimated groundwater discharge rate from the Davis Spring was reported to be approximately 7 acre-feet per year (ac-ft/yr) on an annualized basis in November/December 2007 (MHA 2008), and approximately 9 ac-ft/yr in October/November 2009 (Inyo Co. 2009). The Davis Spring discharge point is located more than 600 feet higher than the groundwater table in the Rose Valley aquifer east of the Davis property at Coso Junction. Spring flow is sustained by high elevation precipitation infiltration in the Sierra Nevada Mountains west of the Davis property. Discharge from the spring that is not used on the Davis property infiltrates back into the ground, after which it percolates downward to recharge the alluvial aquifer. Due to its higher elevation, the Davis Spring is not believed to be directly connected to the Rose Valley groundwater aquifer system. Differences in the stable isotopic composition of the discharge from Davis Spring and Rose Valley waters support the conclusion that the source of Davis Spring is separate from Rose Valley groundwater (MHA, 2008)

- **Sacatar and Little Lake Canyon Springs** – Rockwell (1980) presents data from sampling springs in Sacatar Canyon and Little Lake Canyon in February 1979. The springs were reportedly located at elevations of 4,950 and 3,650 ft amsl, respectively. Sacatar Spring reportedly flowed at a rate of 1 to 5 gallons per minute (1.6 to 8 acre-feet/yr) in November 1975. No flow rate data were identified for Little Lake Canyon Spring. Both springs are located in bedrock outcrops above and west of Rose Valley; and, as a result are not believed to be directly connected to the Rose Valley groundwater aquifer system.

- **Little Lake Fault and Coso Springs** – The Little Lake Fault Spring and Coso Spring are located at the south end of Rose Valley. Little Lake Fault Spring is located on the west side of US 395 approximately one mile south of Little Lake. Coso Spring is located on the east side of US 395, on the Little Lake Ranch property, approximately ¼ mile south of Little Lake. No data have been identified regarding the groundwater discharge rate from the Little Lake Fault Spring. Because it is located in close proximity to Little Lake, Coso Spring is discussed further in the "Little Lake" section below.

G2.4.3. Lakes, Ponds, and Other Surface Water Features

Little Lake, is a perennial lake located at the south end of Rose Valley, to the south of the Haiwee Geothermal Leasing Area, approximately seven miles south of the town of Coso Junction (**Figure G-1**). The majority of Little Lake is located within the Little Lake Ranch, which is a 1,200 acre privately-owned recreational preserve owned and managed by Little Lake Ranch, Inc. Ten acres at the southeast corner of Little Lake is owned by the BLM and includes a visitor overlook. The property includes the approximately 90-acre Little Lake, two smaller perennial ponds, a "siphon well", several other ponds that reportedly contain water intermittently, and adjacent wetland habitat. Little Lake is reportedly 3 to 5 feet deep (MHA 2008); the depths of the other ponds are unknown. The depth and area of the lake have been enhanced by the construction of a low dike along its southern perimeter; consequently, the water level in the lake is regulated by the rate of groundwater inflow into the lake and the setting of a discharge weir located at the south end of the lake.

Because the Little Lake Ranch property is located in a desert area that receives little rainfall, the surface water features and riparian habitat on the property are heavily dependent on an uninterrupted supply of groundwater to maintain surface water flow rates and to sustain plant growth. As a requirement of the approval of the Hay Ranch groundwater diversion project, Inyo County is currently monitoring surface water discharge rates at three locations on the property including the Little Lake Outlet, Coso Spring, and a surface water collection ditch called the North Culvert as well as water levels in Little Lake, several wells on the property (Inyo Co., 2009), and additional wells throughout Rose Valley.

G2.5. Conceptual Groundwater Water Budget

The Rose Valley groundwater system is primarily recharged by mountain front recharge derived from precipitation and snowmelt that falls at higher elevation in the Sierra Nevada front range. The south sloping groundwater table observed at the north end of Rose Valley indicates groundwater enters Rose Valley from Owens Valley to the north and/or from seepages losses from the south Haiwee Reservoir. This inflow is incorporated into the model.

Some precipitation recharge likely occurs in the Coso Range on the east side of the valley but was conservatively neglected for the current modeling effort. The U.S.G.S. (2009) estimated that the recharge from the Coso range might be on the order of 310 to 630 acre-ft/yr, based on analysis using what they termed an "uncalibrated" regional recharge basin characterization model. Also, perhaps as much as 250 acre-ft/yr of groundwater may enter southeastern Rose Valley as upwelling from the Coso geothermal system based on proportions of chloride and stable isotopes in groundwater in southeastern Rose Valley, but was conservatively neglected in this analysis. Leakage from the LADPW aqueducts that traverse Rose Valley was assumed to be a negligible component of total groundwater inflow to the basin.

Currently, the principal groundwater outflow components consist of groundwater underflow and surface water discharges to the Indian Wells Valley to the south, and evapotranspiration from Little Lake and phreatophytic vegetation on the Little Lake Ranch property. Because of the dry climate, essentially all of the precipitation falling on Rose Valley is lost to evapotranspiration. However, because the groundwater table is located 40 or more feet below ground surface over all but the southern tip of the valley, evapotranspiration does not factor into the groundwater budget except on the Little Lake Ranch property. On the Little Lake Ranch property, groundwater rises to the surface through springs, and sustains the 90-acre lake and several ponds. In this area, evaporation from the lake and ponds and transpiration from riparian plants are significant. Inflow and outflow components of the groundwater budget for Rose Valley are discussed in more detail below.

G2.5.1. Simulated Groundwater Inflow Components

Principal inflow components consist of mountain front recharge, groundwater inflow from Owens Valley to the north and/or seepage from Haiwee Reservoir.

- **Mountain Front Recharge** – Precipitation recharge in the Sierra Nevada range west of Rose Valley is the principal source of groundwater to the Rose Valley basin. Due to the rain shadow effect caused by the Sierra Nevada's, the precipitation rate in the Coso Range on the east side of Rose Valley is low. To be conservative, it was assumed that the evapotranspiration potential exceeded potential precipitation recharge throughout Rose Valley and the Coso Range. Methodologies to directly measure mountain front recharge are poorly defined; typically groundwater recharge from precipitation is estimated as a percentage of total recharge.

  Brown and Caldwell (2006) concluded that precipitation rates in the Rose Valley area range from about 6 inches per year (in/yr) on the valley floor to up to 20 in/yr at the crest of the Sierra Nevada range and that only precipitation falling at elevations above 4,500 ft results in groundwater recharge. In the mountains, precipitation rate (including rainfall and snow melt) is strongly dependent on altitude. Danskin (1998) established an empirical relationship between precipitation rate and altitude based on precipitation and snow records collected routinely for more than 50 years in 20 survey stations along the western side of Owens Valley. Using the empirical relationship developed in the Danskin report, Brown and Caldwell estimated that the average precipitation rate for the elevation ranging from 4,500 ft to 6,500 ft was 10 in/yr, increasing to 15 in/yr for parts of the watershed above 6,500 ft. Using a geographic information system (GIS), to evaluate the contribution from areas of varying elevation in the Sierras west of Rose Valley, Brown and Caldwell estimated that the total precipitation volume that could potentially recharge the Rose Valley groundwater basin was approximately 42,000 acre-ft/yr.

  For the purposes of the initial evaluation of potential impacts of groundwater development at Hay Ranch, they further assumed that only 10 % (4,200 acre-ft/yr) of the potential mountain front precipitation recharge actually reaches Rose Valley. Danskin (1998) used a value equivalent to 6% of Sierra Nevada range precipitation for the mountain front recharge component of the numerical groundwater flow model developed to evaluate groundwater development in Owens Valley. Williams (2004) estimated that mountain front precipitation recharge in Indian Wells Valley amounted to approximately 8% of precipitation in the Sierra Nevada range to the west. However, Williams noted that the Maxey-Eakin Method for estimating precipitation recharge in the Sierra Nevada range conservatively neglects areas receiving less than 8 in/yr of precipitation; consequently, higher recharge rates are possible. Because the mountain front precipitation recharge rate as assumed for the Brown and Caldwell groundwater flow model yielded reasonable calibration results in the steady state model, a recharge rate of approximately 4,200 acre-ft/yr was also used in this study.

- **Groundwater Inflow/Seepage from the North** – As noted previously, Weiss (1979) estimated seepage losses from the Haiwee Reservoir to be on the order of 600 acre-ft/yr. Previous investigators (Bauer, 2002; Brown and Caldwell, 2006) and GEOLOGICA's review of groundwater elevation contour patterns in the north end of Rose Valley indicate that groundwater inflow from southern Owens Valley and/or seepage losses from the south Haiwee Reservoir recharge the Rose Valley groundwater basin at the north end of the valley. Using a steady-state numerical groundwater flow model of the Rose Valley groundwater basin, Brown and Caldwell (2006) estimated the groundwater influx from the north to be approximately 788 acre-ft/yr, which is similar to the estimate of Weiss (1979). Recalibration of the numerical groundwater flow model for the 2008 Hay Ranch EIR indicated a slightly higher groundwater inflow rate from the north (Owens Valley/Haiwee Reservoir) of 890 acre-ft/yr.

G2.5.2. Simulated Groundwater Outflow Components

Principal groundwater outflow components from Rose Valley consist of discharge to the Indian Wells Valley from the Little Lake area and an area in the southeast part of the valley, east of Red Hill, and evapotranspiration in the Little Lake area. Limited groundwater extraction was identified in Rose Valley.

- **Groundwater Discharge from Southeastern Rose Valley** – Brown and Caldwell (2006) estimated that approximately 2,050 acre-ft/yr of groundwater discharges from Rose Valley in the southeast part of the valley (southeast of Navy well 18-28) as underflow to Indian Wells Valley. Williams (2004) concluded that existing estimates of recharge to the Indian Wells Valley significantly underestimated interbasin transfers and referenced an estimate of groundwater underflow from Rose Valley to Indian Wells Valley of 10,000 acre-ft/yr developed by Thompson (1929). Recalibration of the numerical groundwater flow model for Rose Valley indicated an underflow rate from Rose Valley to Indian Wells Valley in this area of 850 acre-ft/yr. This is less than half the value of 2,050 acre-ft/yr assigned to this term in the Brown and Caldwell (2006) numerical modeling analysis. This difference is discussed in the model calibration section.

- **Groundwater Discharge at Little Lake** – Groundwater discharge by several processes in the Little Lake area is the dominant outflow component from Rose Valley. The processes operating at Little Lake include:

- Evaporation from the lake surface;
- Transpiration from phreatophyte plants on the property;
- Discharge from Coso Spring;
- Discharge from the Little Lake Weir; and
- Discharge from the Little Lake Siphon well.

Bauer (2002) estimated that evaporation from the Little Lake water surface consumes approximately 500 acre-ft/yr based on a lake surface area of 75-90 acres and evaporation rate of 80 in/yr. Plant communities identified on the Little Lake Ranch property were described as akalai desert (saltbush scrub), palustrine (pond) and lacustrine (lake) wetlands, and riparian (creek) habitat. Beginning in 2000, Little Lake Ranch, Inc., conducted various projects intended to restore or enhance 90 acres of lacustrine wetlands, 10 acres of palustrine emergent wetlands, about 6 acres of palustrine/riparian habitat (1.6 mile long creek corridor), and an additional 220 acres of wetland and upland habitat, and 1 acre of wetland and associated upland habitat was acquired. As a result of shallow groundwater in this area, plant communities on and near the Little Lake Ranch property have greater access to groundwater than occurs elsewhere in the valley. GEOLOGICA (2008) estimated that transpiration processes in the Little Lake area could consume up to 700 acre-ft of groundwater per year. The domestic well by the ranch house, several irrigation wells, and the former Little Lake Hotel well are not believed to extract significant quantities of groundwater. All of the groundwater discharged in the Little Lake area that is not evaporated or transpired by plants reportedly infiltrates back into the ground on the property and continues as groundwater underflow to Indian Wells Valley (no surface water flow leaves the property). Because of considerable uncertainty in actual evapotranspiration rates, and the relative contribution of groundwater underflow, overland flow, and evaporation from ponds and other surface water features further south on the ranch property, groundwater consumption on the Little Lake Ranch property was calculated in the 2010 version of the numerical model using evapotranspiration cells to represent evaporation from Little Lake and drain cells to represent discharge to Indian Wells Valley and all other consumptive uses of groundwater on the property.

- **Existing Extraction Wells** – Groundwater in Rose Valley is used for domestic drinking water supply, limited irrigation, light industrial processes, and, at the south end of the valley, for maintenance of riparian habitat in the Little Lake area. The Draft EIR for the Hay Ranch Water Extraction and Delivery System Project (MHA 2008) estimated that approximately 40 acre-ft/yr of groundwater production from wells occurs in Rose Valley. As many as 30 domestic wells are believed to extract relatively small quantities of groundwater for domestic uses and small scale irrigation in the Dunmovin area. Several wells at Coso Junction including a well at the Coso Junction Ranch, Coso store, and the CalTrans rest area produce water for drinking, irrigation, or light industrial purposes. The Coso Ranch North well and northern Coso Junction Store well (Coso Junction #1) are not being used at present. Rockwell (1980) reported that irrigation pumping at the Rose Valley Ranch (now referred to as the Hay Ranch) started in 1975, and averaged approximately 3,000 acre-ft/yr. In 1979 the Rose Valley Ranch reportedly pumped approximately 3,130 acre-ft/yr of groundwater from the two wells on the property for alfalfa irrigation. Alfalfa farming ceased sometime in the early 1980's. No significant agricultural irrigation, or groundwater extraction for any other purpose, has occurred in the valley since that time. Wells on the Navy property in Rose Valley including the Lego well, well G-36, and well 18-28 are not being pumped.

Groundwater extraction is specified in several existing wells in Rose Valley in the steady-state model including:

- Domestic supply in the Dunmovin area is represented in the groundwater flow model with a single well pumping at a steady rate of 8.5 acre-ft/yr based on estimates from the Rockwell (1980) hydrologic study.
- Water supply for the Coso Junction store and CalTrans rest stop is represented in the groundwater flow model with a single well pumping at a steady rate of 17 acre-ft/yr.
- Irrigation and light industrial supply at the Coso Junction Ranch property is represented in the groundwater flow model with a single well pumping at a steady rate of 17 acre-ft/yr.

The same steady state groundwater extraction rates were specified in the transient model. In addition, two intervals of pumping from the LADWP's V817 well in March 2009 (of 1-1/2 days and 6-1/2 days) and pumping for 14 days from the Hay Ranch south well in late November 2007 were simulated in the transient calibration model.

G2.5.3. Groundwater Budget

The groundwater elevation monitoring data suggest that groundwater inflows have equaled or slightly exceeded groundwater outflows from the Rose Valley groundwater basin in the past five years. Assuming that groundwater inflows equal outflows, that is, that steady state conditions prevail, the resulting conceptual Rose Valley groundwater budget is tabulated in the table below. Some of these components are estimated based on independent studies (e.g. Mountain Front Recharge) and some values are derived from the model after adjustments for model calibration (e.g. groundwater underflow from Rose Valley to Indian Wells Valley). Values from the 2008 version of the Rose Valley numerical groundwater flow model are also listed for comparison purposes:

Table G-2: Rose Valley Groundwater Budget

Budget Components	Values Cited in the Literature	2008 Model		2010 Model	
		Flow Rate acre-ft/yr	Simulation Package used in Model	Flow Rate acre-ft/yr	Simulation Package used in Model
Groundwater Inflow					
Mountain Front Recharge from	2,040-	4,197	Well (Specified	4,197	Well (Specified

west	4,070(5)		Flux)		Flux)
Recharge from Coso Range	310-630(5)	0	--	0	--
Groundwater Underflow from the North	0(5) 600(6) 788(1)	898	Constant Head	898	Well (Specified Flux)
Total Inflow		**5,095**		**5,095**	
Groundwater Outflow					
Existing extraction wells		38	--	42	Well
Groundwater underflow to Indian Wells Valley exiting from southeastern Rose Valley	2,050(1)	848	General Head	2,102	General Head
Evaporation from Little Lake	500(2)	462	Evapo-transpiration	416	Evapo-transpiration
Phreatophyte and Riparian plant transpiration on Little Lake Ranch property	700(7)	--	--	--	--
Groundwater Discharge through Little Lake Gap to Indian Wells Valley	0(5) 3,300(3) 10,000(4)	3,747	General Head	2,537	Drain
Total Outflow		**5,097**		**5,097**	

Source:

1) Brown & Caldwell (2006)
2) Bauer (2002)
3) Williams (2004)
4) Thompson (1929)
5) U.S.G.S. (2009)
6) Weiss (1979)
7) GEOLOGICA (2008)

G3. NUMERICAL MODEL DEVELOPMENT

Brown and Caldwell (2006) developed a three-dimensional, numerical model of the Rose Valley groundwater basin which was then revised, and recalibrated, by GEOLOGICA for the Hay Ranch Groundwater Extraction Project EIR (GEOLOGICA, 2008), and, revised and recalibrated, by GEOLOGICA for the current study. Groundwater flow evaluations were conducted using the U.S.G.S. MODFLOW computer code (McDonald and Harbaugh, 1988) implemented in the Groundwater Vistas graphical environment (Version 5, Environmental Simulations, 2007). The revised model incorporates new groundwater elevation data and lithologic information from monitoring well drilling and logging conducted for the Hay Ranch Monitoring Project (Inyo Co. 2009, 2010), as well as time-drawdown data from a 6-1/2-day pumping test conducted on the LADWP property in March 2009.

G3.1. Overview of Model Revisions

The numerical groundwater flow model of Rose Valley modified for Hay Ranch Groundwater Extraction Project EIR (GEOLOGICA, 2008), aka, the Rose Valley Model, was revised for the current study to better represent the structure of the local aquifer system, and to address comments from various sources regarding model input parameters, boundary conditions, calibration, and sensitivity analysis. Specific revisions are summarized below:

- **Northern Inflow Boundary** – The 2008 version of the Rose Valley Model utilized a Constant Head Boundary condition along the northern edge of the model domain to represent groundwater inflow from Owens Valley, seepage losses from the South Haiwee Reservoir, and mountain front recharge at the far north end of the valley. Several reviewers noted that the groundwater flux calculated by MODFLOW for a Constant Head Boundary could be artificially high if groundwater extraction was specified too close to the boundary. For the current study, the Constant Head Boundary nodes were removed from the model and replaced with specified flux (well) cells to limit groundwater inflow in this area to specified rates based on the water budget analysis discussed in Section G.2.5.1.
- **Southern Outflow Boundary** – The 2008 version of the Rose Valley Model utilized a General Head Boundary condition along the southern edge of the model domain near Little Lake to represent groundwater outflow from the Rose Valley aquifer to the Indian Wells valley to the south. Several reviewers commented that under conditions of extreme aquifer drawdown, the General Head Boundary nodes could allow the simulation code to force water to enter the model along the southern boundary, which is implausible in the conceptual model for the site. In addition, the U.S.G.S. (2009) noted that the close proximity of the General Head Boundary nodes to the evapotranspiration nodes specified to represent evaporation from Little Lake could make the model unstable. The General Head Boundary nodes were replaced with Drain nodes, which only allow outflow, and moved approximately 2,000 feet to the south to provide additional separation from Little Lake.

- **Model Layering Scheme** – The 2008 version of the Rose Valley Model was subdivided into 4 model layers, with the two uppermost layers representing alluvial deposits, and the two lower layers representing the Coso Lake Bed and Coso Sand members, respectively. Several reviewers commented that the representation of the Coso Lake Bed and Coso Sand geologic units in the model exaggerated the amount of groundwater available for extraction. Consequently, to ensure a conservative evaluation of impacts from groundwater extraction in the valley, the two lower model layers were removed from the model. It should be noted that the revised model, comprised of two model layers, only approximately represents groundwater conditions in the north central part of the valley around the Hay Ranch property where recent drilling and lithologic logging activity suggests that there may be three groundwater-bearing zones, which would require, at a minimum, three model layers to represent in greater detail. Revising the model to represent this condition was beyond the scope of this study and impractical with available hydrogeologic data.

- **Location of Mountain Front Recharge** – The U.S.G.S. (2009) noted that the presence of springs east of the Sierra Nevada mountain front suggests that there is a lateral barrier to groundwater flow (on the western edge of the model domain) that would limit the direct infiltration of mountain front recharge such that most, if not all, of the mountain-front recharge should be simulated in model-layer 1. Consequently, mountain-front recharge simulated using specified flux cells was limited to model-layer 1 in the revised model rather than being distributed across the deeper model layers as was done previously.

- **Lack of Transient Calibration** – Several reviewers commented that the 2008 version of the Rose Valley Model was only calibrated to steady-state conditions which may unconservatively represent conditions during pumping. To address this concern, a transient calibration was conducted using water level data collected in Rose Valley during the two year period from November 2007 to November 2009. In addition, the model was calibrated to time-water level data collected during pumping tests conducted in September/October 2007 on the Hay Ranch property and March 2009 on the LADWP property. The accuracy of the transient model calibration was further assessed by conducting a model confirmation run using time-water level data from the first nine days of intermittent pumping for the Hay Ranch Groundwater Transfer Project beginning in late December 2009.

- **Uncertainty in Aquifer Storage Properties** – Because insufficient data were available to estimate aquifer specific yield, the 2008 version of the Rose Valley Model used a range of values (10, 20, and 30%) for groundwater resource development scenarios that were not used in the model calibration process. The groundwater development scenarios used in the current development impact analysis utilize the final calibrated specific yield value estimated from the transient model calibration. In addition, sensitivity analysis was conducted to assess the sensitivity of the transient model calibration to uncertainty in specific yield.

- **Excessive Model Error near LADWP Wells** – The reviewer for the LADWP noted that the 2008 version of the Rose Valley Model underpredicts groundwater elevation at the LADWP's wells at the north end of the valley by nearly 120 ft. Using data from the pumping test conducted on that property in March 2009 to adjust local aquifer properties, the recalibrated model reduces the error in simulated groundwater elevation at this location to less than 3 ft.

- **Model Grid Spacing** – To further improve the accuracy of the model, the maximum grid spacing was reduced from ¼ mile (1,320 ft) to 1/8 mile (660 ft). In addition, the model grid was refined to a minimum spacing of approximately 220 ft near the Hay Ranch property where new monitoring wells were recently installed to allow better representation of response to pumping.

G3.2. Model Domain and Finite Difference Grid

The model domain covers approximately 132 square miles, extending up to 8.25 miles in the east-west direction and up to 16 miles in the north-south direction (**Figure G-1**). The model domain extends from the groundwater divide near the south Haiwee Reservoir on the north to the Little Lake Gap area to the south, and is bounded by impermeable boundaries representing the Sierra Nevada Mountains on the west and by Coso Range to the east. Consistent with the representation developed in the 2006 and 2008 numerical models of Rose Valley, the southern edge of the active portion of the model grid extends to just beyond the south edge of Little Lake; consequently, Coso spring, the Little Lake Ranch siphon well, and palustrine and riparian wetland areas south of Little Lake are not explicitly represented in the model.

The model domain was discretized into 137 rows, 71 columns, and 2 layers. The maximum cell size of the grid is 1/8 mile in both length and width, representing a 10-acre area. The model grid was refined to a minimum spacing of approximately 220 ft near the Hay Ranch property where new monitoring wells were recently installed to allow better representation of response to pumping. No flow (inactive) model cells were specified along the east and west margins of the model domain to represent the shape of the aquifer within basin fill deposits.

G3.2.1. Model Layer Configuration

Three model layers were originally used to represent the aquifer system in the 2006 version of the Rose Valley groundwater model. As part of the 2008 recalibration process, GEOLOGICA subdivided the uppermost model layer into two layers to better represent the semi-confined behavior of the aquifer, resulting in a four-layer model. The location of the contact between layers 1 and 2 was specified as being just below the bottom depth of shallower wells in the valley (including Cal-Pumice, Coso Store #1 and #2, and the Lego, G-36, and 18-28 wells) which is on the order of 400 ft bgs. The uppermost two layers (layers 1 and 2) were configured to represent: debris flows and debris avalanche in the Dunmovin Hill in the northern part of Rose Valley; the recent alluvial deposits in the center of Rose Valley, and interbedded volcanic deposits and alluvium in the south and southeast part of Rose Valley. The lower two layers were intended to represent the Coso Lake Bed and Coso Sand members, respectively. As noted in Section G3.1, the two lower model layers were removed from the current version of the Rose Valley model to more conservatively represent potential impacts from groundwater extraction.

Model layer 1 is specified as unconfined with transmissivity determined by MODFLOW as the product of horizontal hydraulic conductivity and current saturated thickness and storage represented using specific yield. Layer 2 is configured as a confined, but variable transmissivity unit in MODFLOW with transmissivity calculated as the product of horizontal hydraulic conductivity and the layer thickness at that location and storage represented using a confined aquifer storativity value.

Model layers 1 and 2, together, were constructed to have variable thickness and spatial extent. The basis for specifying layer thickness and the bottom elevation of each of layers is described in Brown and Caldwell (2006). Total model thickness from land surface ranges from 150 ft within Little Lake Gap to approximately 800 ft near the Hay Ranch property.

G3.2.2. Model Boundary Conditions

The active portion of the model domain is bounded on the west and east by by inactive cells representing igneous and metamorphic rocks of the Sierra Nevada and Coso Range which are presumed to be impermeable. Groundwater discharge to Indian Wells Valley in the southeast part of Rose Valley (east of Red Hill) through fractured basalt flows and/or basalt flows overlying alluvial deposits was represented using a head dependent boundary condition. Model cells that represent bedrock areas form the inactive portion of the model domain and also serve as no-flow boundaries. Boundary conditions specified in Layers 1 and 2 are depicted in Figures G-a and G-b, respectively.

- **No Flow Boundaries/Inactive Cells** – The location of no flow boundaries, and thereby, inactive cells in the model domain were similar to those specified in the 2008 model with the exception that after the model grid spacing was refined, the shape of the southern model boundary was smoothed to better conform to the estimated extent of alluvial deposits in that area. **Figure G-5** shows the location/configuration of inactive model cells.

- **Specified Flux Boundaries** – Specified flux boundary cells in model layer 1 were used to represent mountain front recharge derived from precipitation and snowmelt that falls on the Sierra Nevada on the west side of the model grid, and, groundwater inflow from the north and seepage from the South Haiwee Reservoir along the northern model boundary. The flow rates for the specified flux cells were set to constant annualized rates based on the groundwater budget developed for the Hay Ranch EIR (Geologica, 2008) and discussed in **Section G2.5**. Sensitivity analyses, discussed in **Section G-3.3.3**, were conducted to evaluate the sensitivity of the steady-state and transient model calibration results to the magnitude of the northern boundary inflow and western boundary inflow.

- **Evapotranspiration** – Surface water evaporation from Little Lake and evapotranspiration from phreatophyte plants around the lake was represented using the MODFLOW Evapotranspiration (ET) package with ET cells specified in model layer 1 over the approximate footprint of the lake. The extinction depth for the ET cells was set to 15 ft below ground surface, the same value as was used in the 2006 model, and consistent with the value used in the USGS model of Owens Valley (Danskin, 1998). Bauer (2002) estimated the surface water evaporation rate from Little Lake to be approximately 500 acre-ft per year, presumably when the lake is at its maximum depth. The relationship between lake level and surface area is unknown, presumably, at lower water levels the lake covers less area and may lose less water to evaporation. MODFLOW reduces the calculated evapotranspiration loss in proportion to the groundwater table depth below ground surface; no evapotranspiration occurs when the groundwater table is at or below the extinction depth (15 ft), half as much evapotranspiration is calculated when the groundwater table is located at half the extinction depth (7.5 ft) below ground surface. The evapotranspiration rate was adjusted during model calibration to yield a total evapotranspiration loss of approximately 500 acre-ft per year in the steady state model, consistent with the 2006 model.

- **General Head Boundary** – Groundwater outflow to Indian Wells Valley from the southeast part of Rose Valley near well 18-28 was simulated using general head boundary (GHB) cells specified in model layer 2. GHB cells in MODFLOW allow groundwater inflow or outflow from the model at a rate dependent on the difference between groundwater elevation in the model and a specified elevation and a conductance assigned to the general head boundary cell; however, the groundwater elevation in the GHB cell is calculated by MODFLOW during a simulation, not fixed like a Constant Head boundary cell. Brown and Caldwell used groundwater elevations measured in the Lego Well in Rose Valley and historical water level elevations measured in the Indian Wells Valley (presented in Bloyd and Robson, 1971) to estimate the flow across this boundary. The conductance and groundwater elevation in the GHB cells were adjusted during this model calibration process to better simulate groundwater elevations observed in the southeast part of Rose Valley.

- **Drain Nodes** – The groundwater outflow to Indian Wells Valley in the Little Lake area was represented using MODFLOW Drain nodes specified in Model Layer 1, at the south end of the model grid near Little Lake (**Figure G-5**). This is a departure from the treatment of this groundwater outflow term in the 2008 model in which General Head Boundary cells were used to represent groundwater discharge from the south end of Rose Valley.

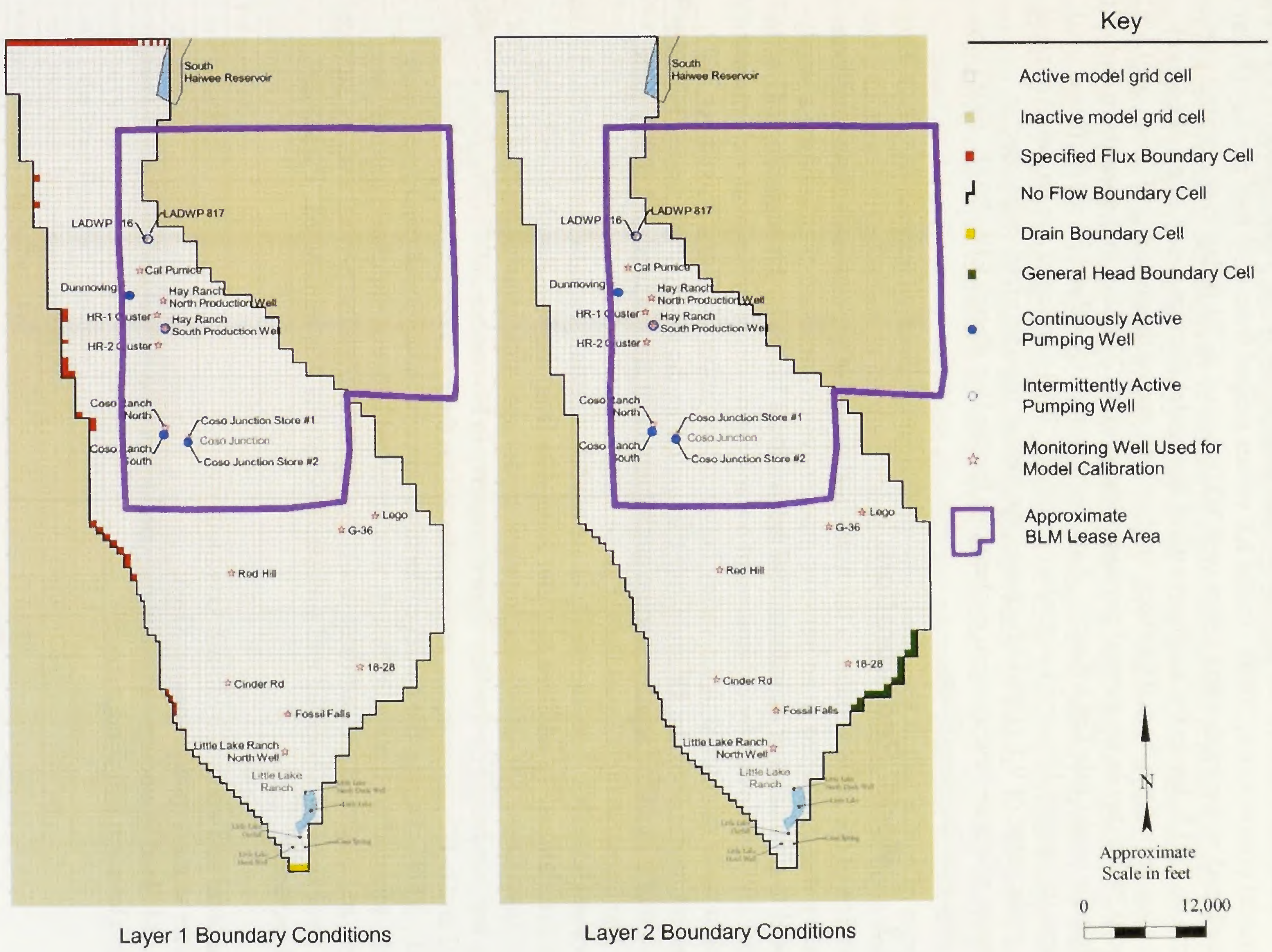


Figure G-5: Model Boundary Conditions – Layers 1 and 2

G3.2.3. Initial Aquifer Parameters

Initial values for key aquifer parameters including horizontal hydraulic conductivity (Kh), vertical hydraulic conductivity (Kz), water table specific yield (Sy), and aquifer storativity (Ss) were specified based on the final calibrated values used in the 2008 version of the Rose Valley model (GEOLOGICA, 2008). Initial Kh values ranged from 0.55 foot per day (ft/day) in the north end of the model grid (from well V816 north), to 24 ft/day in the central portion of the grid, to 200 ft/day in the southern end of the model domain near Little Lake Ranch. Initial Kz values ranged from 0.05 ft/day in the north end of the model grid (from well V816 north), to 0.019 ft/day in the central portion of the grid, to 20 ft/day in the southern end of the model domain near Little Lake Ranch. A uniform storativity value of 1 x 10^{-7}/ft was used throughout the model domain in accordance with the 2008 version of the model. An initial specific yield value of 0.1 (10%) which was the lowest specific yield value used in groundwater resource development evaluations for the Hay Ranch EIR (RMT, 2008) was used in initial calibration efforts.

G3.3. Model Recalibration

Recalibration of the 2008 version of the numerical model of groundwater flow conditions in Rose Valley was conducted in an iterative process which consisted of calibrating a steady-state model to groundwater elevations observed in Rose Valley at the beginning of November 2007, followed by calibration of a transient model to groundwater elevations observed in wells monitored in the valley between November 2007 and November 2009. The transient model used the same aquifer parameters as the steady-state model, with the exception that it included aquifer storage coefficients that are not used in a steady-state model. The transient model was linked to the steady-state model in that it used the final groundwater elevations from the steady-state model as initial groundwater elevations for the transient simulations. In addition to water level data from the Hay Ranch Monitoring Program (Inyo Co., 2009, 2010), the transient model used time-drawdown data from a 14 day pumping test conducted on the Hay Ranch property in November 2007 (GEOLOGICA, 2008) and 1-1/2 and 6-1/2 day pumping tests conducted on the LADWP property in March 2009 (LADWP, 2009). During the model calibration process, model input parameters were iteratively adjusted until a visual best fit was observed between simulated groundwater elevations and observed groundwater levels during the calibration period, and, the summed squared error between observed and simulated elevations was minimized. Parameters adjusted included:

- Horizontal and vertical hydraulic conductivity;
- Aquifer storativity and specific yield;
- General Head Boundary elevation and conductance;
- Drain elevation and conductance.

G3.3.1. Final Calibrated Model Parameters

Final parameter values are listed in **Table G-3**. The spatial distributions of calibrated parameter values are illustrated on **Figures G-6** and **G-7**. The main changes in aquifer parameter values in the revised model compared to the 2008 model were in the horizontal hydraulic conductivity in the north and central parts of the model grid, vertical hydraulic conductivity in the central part of the grid, storativity values in the central and northern part of the grid, and specific yield throughout the model domain.

Horizontal hydraulic conductivity at the north end of the model grid including, and north of the LADWP property, was set to 0.55 ft/day in the 2008 model, yielding an aquifer transmissivity in that area of approximately 500 ft^2/day. However, a pumping test conducted by LADWP (2009) on their property in March 2009 indicated higher transmissivity in the area on the order of 1,340 ft^2/day. Horizontal hydraulic conductivity in this area was increased to 2 ft/day during the model calibration process, yielding a significantly better fit between observed and simulated steady-state groundwater elevation. An apparent low permeability zone was identified between the Cal Pumice well and LADWP wells 816 and 817, based on the presence of very high groundwater elevation gradients in that area (see **Figure G-3**). Horizontal hydraulic conductivity was decreased in that region in model layers 1 and 2 in an iterative fashion to improve the match between simulated and observed groundwater elevations north of this region.

Table G-3: Summary of Final Calibrated Parameter Values

Parameter	Parameter Value	Units
Northern Boundary Kh	2	ft/day
Northern Boundary Kz	0.02	ft/day
V816 to Pumice Well Kh	0.24	ft/day
V816 to Pumice Kz	0.024	ft/day
Hay Ranch Transition Kh	7.5	ft/day
Hay Ranch Transition Kz	0.75	ft/day
Central Valley Kh L1	50	ft/day
Central Valley L1 Kz	0.001	ft/day
Central Valley Kh L2	12.8	ft/day
Central Valley L2 Kz	0.01	ft/day
Southeastern Kh	100	ft/day
Southeastern Kz	10	ft/day
Volcanics Kh	1	ft/day
Volcanics Kz	0.1	ft/day
Little Lake Kh	112.5	ft/day
Little Lake Kz	11.25	ft/day
Southeast General Head Boundary Elevation	3,140	ft
Southeast General Head Boundary Conductance	367	ft2/day
Little Lake Drain Boundary Elevation	3,110	ft
LittleLake Drain Boundary Conductance	6.60E+05	ft2/day
Northern Boundary Specified Flux	107,088	cfd
Sierra Recharge	500,560	cfd
Northern Sy	0.035	-

Northern Ss	3.50E-06	1/ft
Central Sy	0.1	-
Central Ss	1.50E-06	1/ft
Southern Sy	0.1	-
Southern Ss	3.50E-06	1/ft

Lithologic logging data made available by construction of two sets of clustered monitoring wells on the Hay Ranch property in 2009 (SGSI, 2009a, 2009b, and 2009c) revealed more strongly anisotropic soils in the area than previously estimated. Soils in the upper 200 feet of the soil column were gravelly, while soils below that depth were found to be more fine-grained. In addition, two distinct clay horizons were identified in both clustered boring locations that SGSI concluded would function as aquitards. These two clay aquitards cannot be represented explicitly in the two-layer numerical model. The hydraulic effect of the shallow high permeability gravel horizon overlaying less permeable sands and silts at depth was represented by assigning a higher horizontal hydraulic conductivity (50 ft/day) in the central portion of model layer 1 and lower horizontal hydraulic conductivity (12.8 ft/day) in model layer 2. The hydraulic effect of the two clay aquitards was represented by assigning low vertical hydraulic conductivities to model layers 1 and 2 of 0.001 and 0.01 ft/day, respectively, effecting vertical anisotropy ratios of 50,000 to 1 and 1,280 to 1. Elsewhere in the model, higher vertical anisotropy ratios of 10 to 1, more typical of natural sediments absent low permeability aquitards, were used.

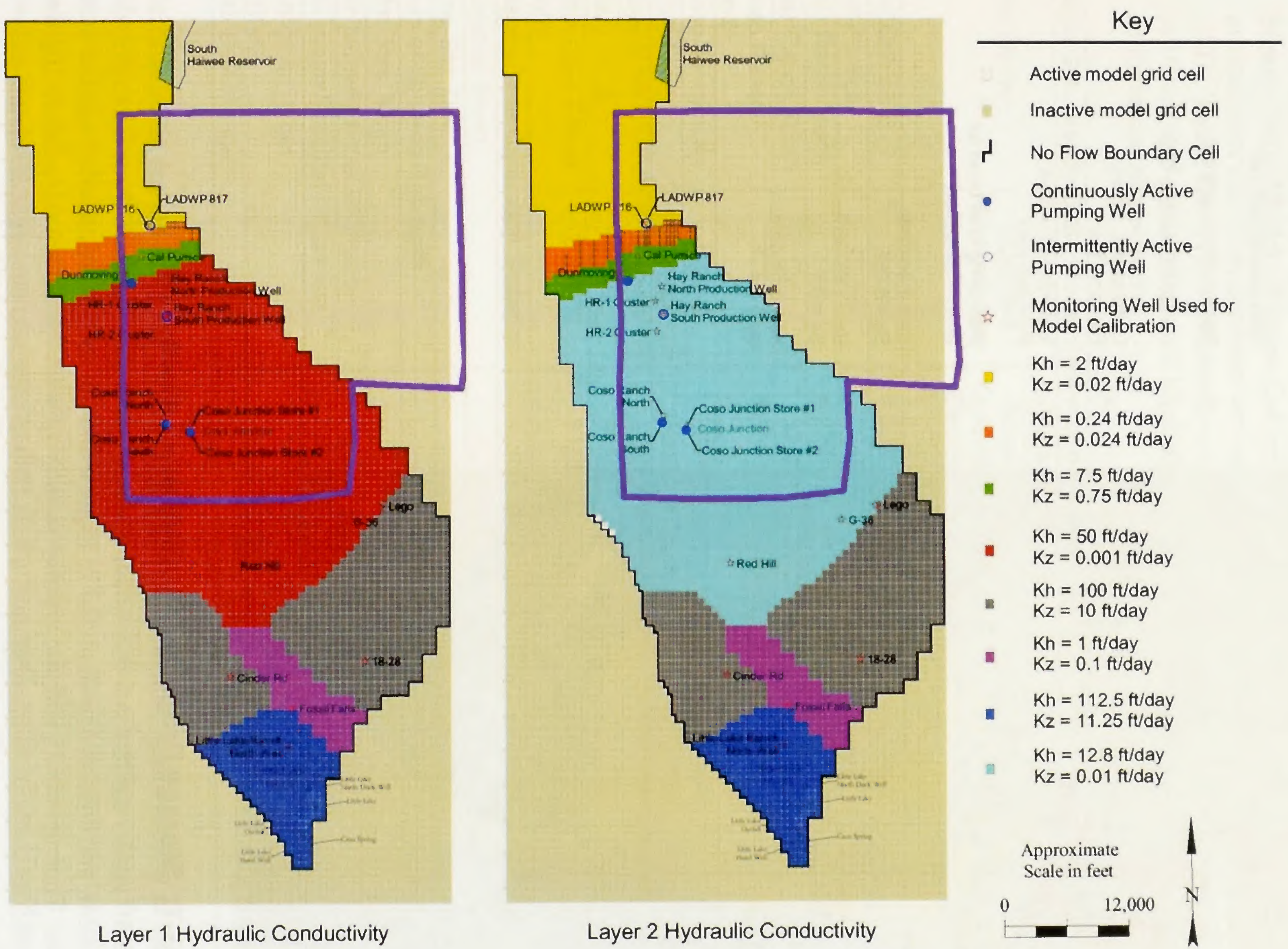


Figure G-6: Hydraulic Conductivity Distribution – Layers 1 and 2

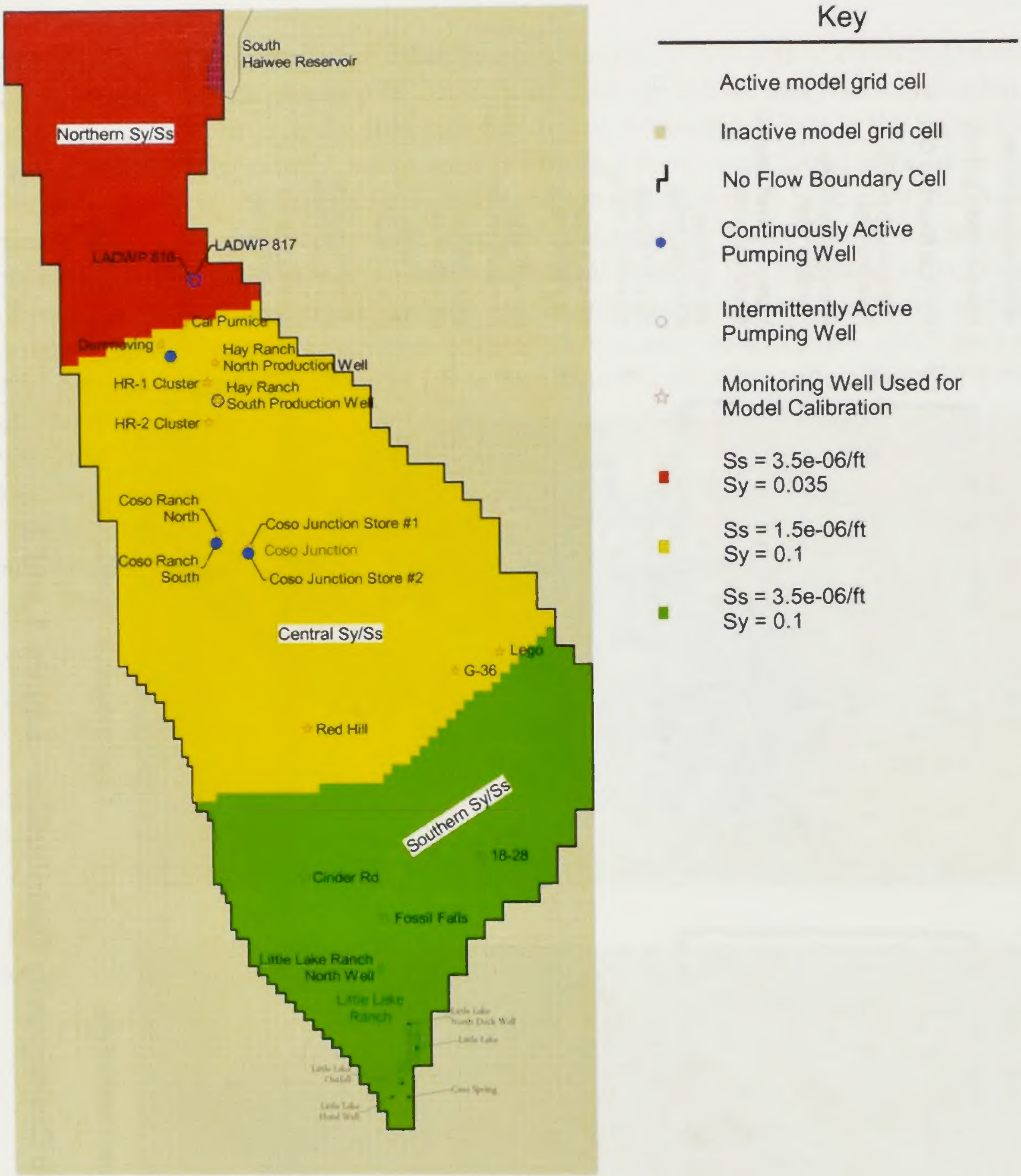


Figure G-7: Storage Property Distribution – Layers 1 and 2

For the 2010 model calibration, the model domain was subdivided into three subregions, north, central, and southern as depicted in **Figure G-7** for the specification of aquifer storage properties. Then specific yield and aquifer storativity were iteratively adjusted during the transient model calibration process until a best fit was obtained between simulated and observed groundwater elevations.

G3.3.2. Calibrated Model Accuracy

The accuracy of the model calibration efforts was evaluated by comparison of simulated groundwater elevations and groundwater elevations observed in November 2007.

- **Steady-State Model – Figure G-8** presents a plan view map comparing simulated groundwater elevation contours versus groundwater elevations observed in November 2007. **Table G-4** below summarizes simulated versus observed groundwater elevations at 10 selected monitoring well locations for the 2008 and 2010 steady-state model calibrations, respectively.
-

Table G-4: Steady-State Model Calibration Summary

Well Name	Observed Groundwater Elevation, ft	2008 Model		2010 Model	
		Simulated Groundwater Elevation, ft	Calibration Residual Difference	Simulated Groundwater Elevation, ft	Calibration Residual Difference
LADWP V816	3434	3326.0	108	3431.1	2.9
Cal-Pumice	3266	3247.9	18.1	3253.4	12.6
Hay Ranch North	3245	3243.8	1.2	3244.6	0.4
Hay Ranch South	3241	3242.2	-1.2	3241.2	-0.2
Coso Ranch North	3232.7	3231.0	1.7	3232.1	0.6
Coso Junction #1	3229.3	3227.1	2.2	3228.2	1.8
Navy Lego	3200.5	3203.3	-2.8	3197.3	3.2
Navy G-36	3199.6	3203.3	-3.7	3198.8	0.8
Navy 18-28	3188.2	3182.2	6.0	3182.4	5.6
Little Lake Ranch North	3158.95	3158.1	0.8	3158.7	0.3
Steady-State Calibration Statistics					
Residual Mean			13.0		2.8
Res. Std. Dev.			32.2		3.7
Sum of Squared Residuals			12069		212.3
Abs. Res. Mean			14.6		2.8
Minimum Residual Difference			-3.7		-0.2
Maximum Residual Difference			108		12.6
Range in Target Values			275		275
Std. Dev./Range			0.12		0.013

The calibration residuals for the 2010 model show considerable improvement at the north end of the valley on the LADWP property where the difference between observed and simulated groundwater elevation decreased from 108 ft in the 2008 model to less than 3 ft in the 2010 model. Calibration residuals for the remaining observation wells were generally lower in the 2010 model and except for the Cal-Pumice well, north of the Hay Ranch property, and the Navy 18-28 well in the southeast end of the valley, are less than 4 ft.

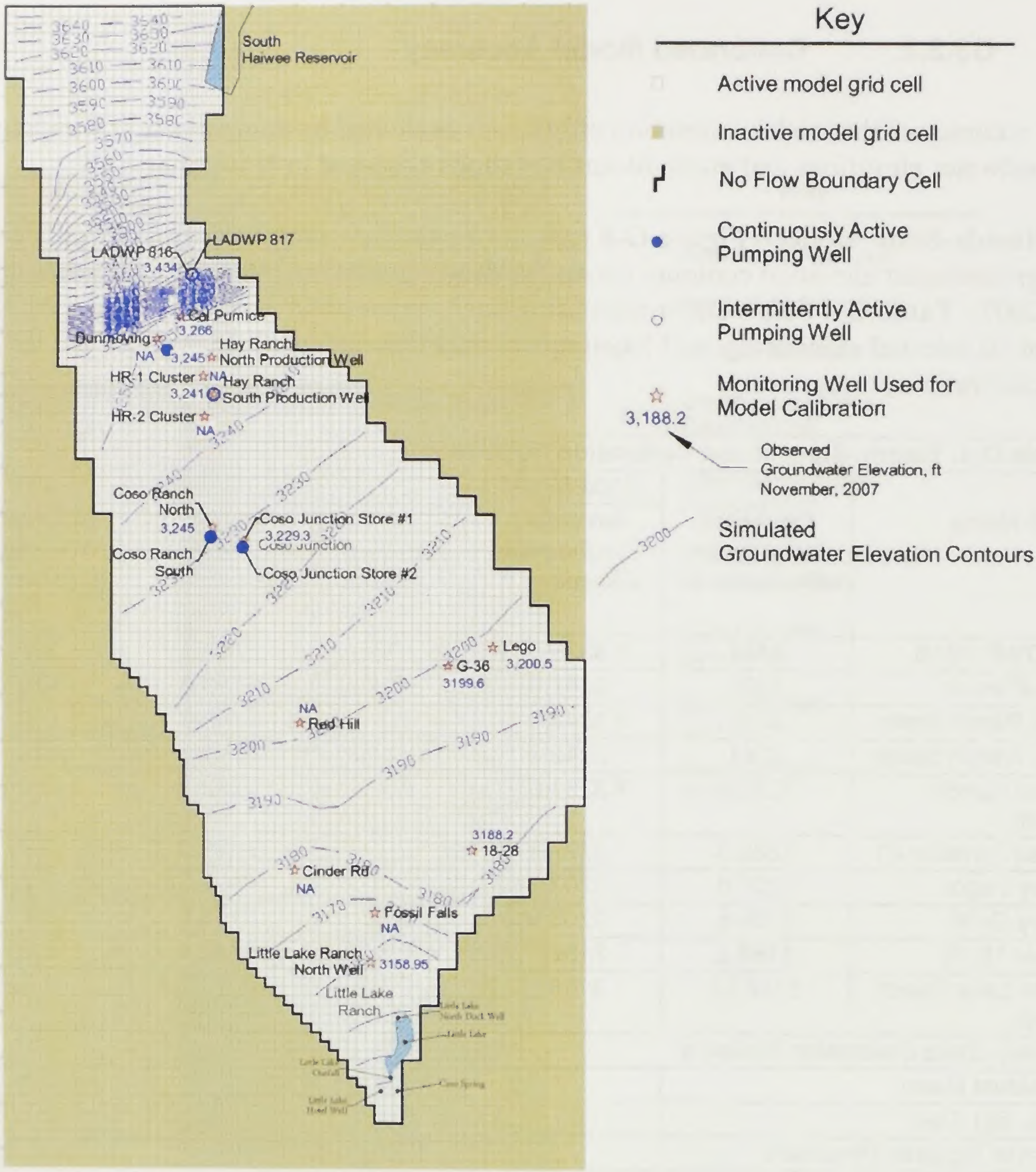


Figure G-8: Steady-State Model Calibration Results

- **Transient Model** – Figures G-9-1 through G-9-5 depict simulated versus observed groundwater elevation in fourteen selected monitoring wells in Rose Valley. **Table G-5** summarizes calibration statistics calculated by Groundwater Vistas for the 2010 transient model calibration.

Table G-5: Transient Model Calibration Statistics	
Residual Mean	1.3
Res. Std. Dev.	3.4
Sum of Squared Residuals	18075.7
Abs. Res. Mean	1.7
Minimum Residual Difference	-15.3
Maximum Residual Difference	13.7
Range in Target Values	290.6
Std. Dev./Range	0.012

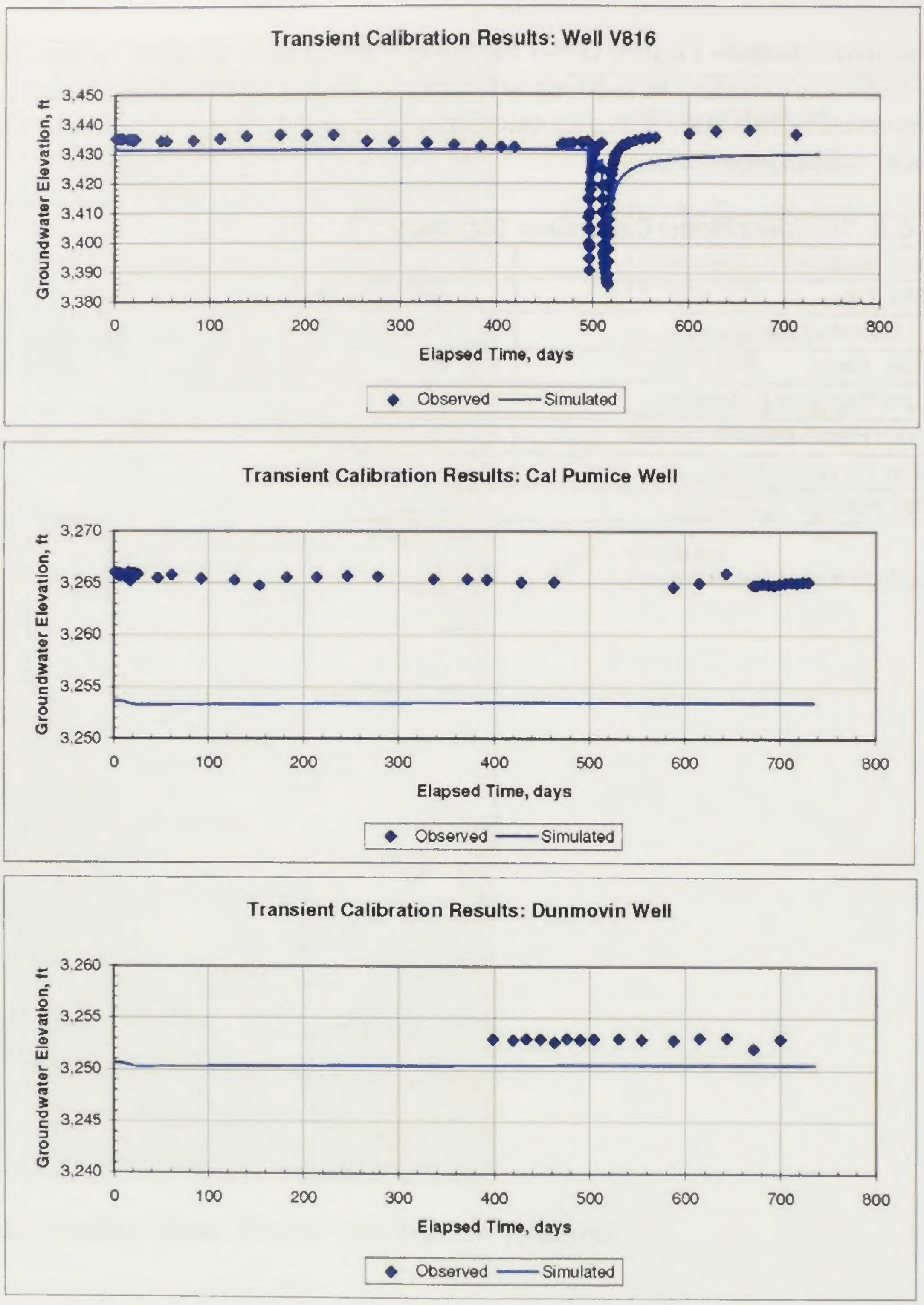
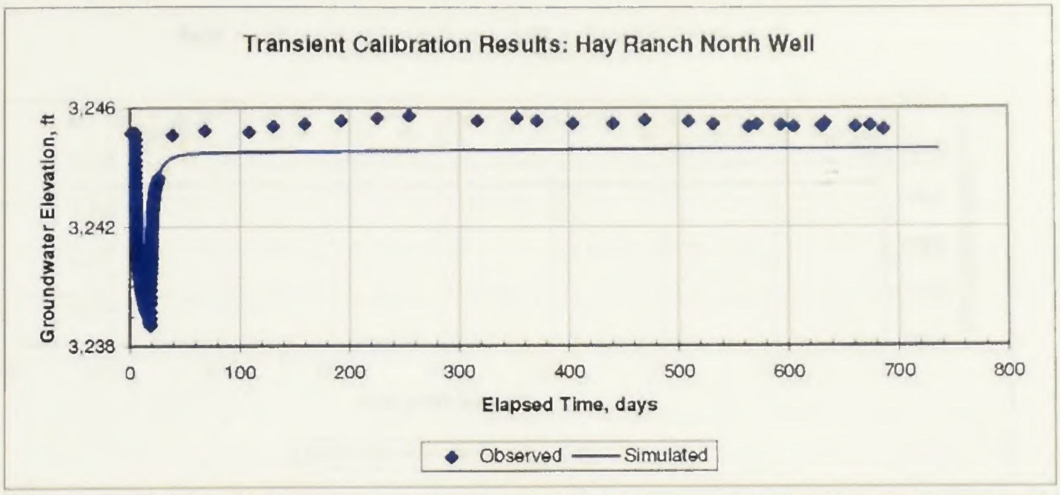
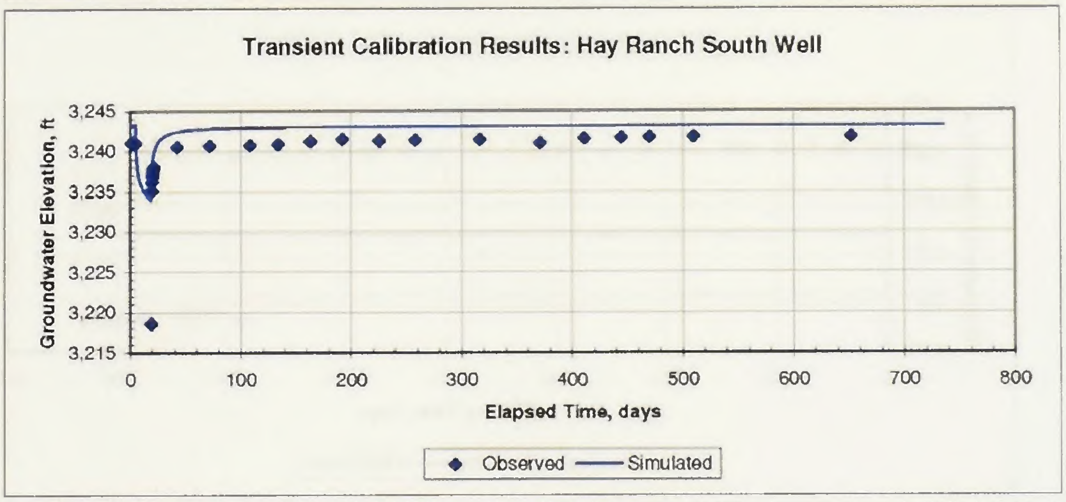


Figure G-9-1: Transient Calibration Results





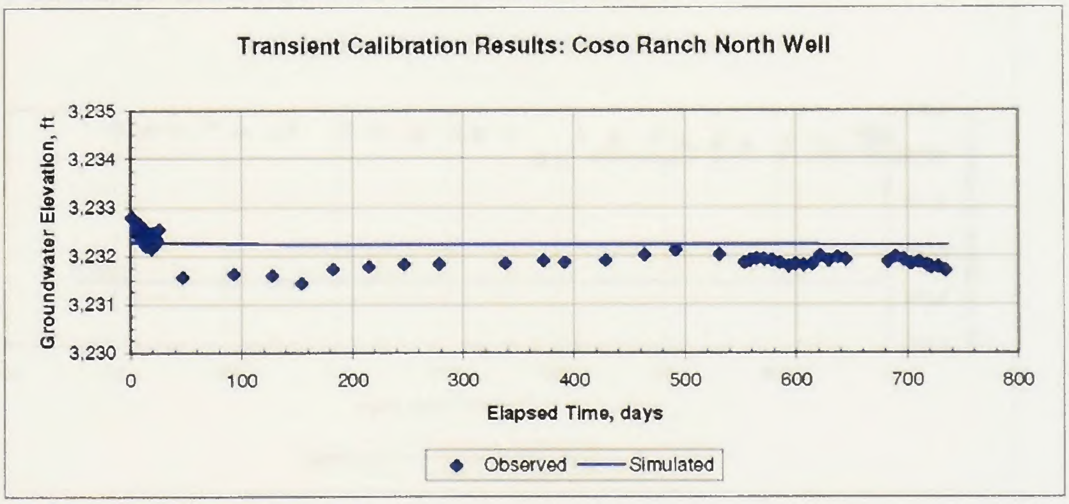
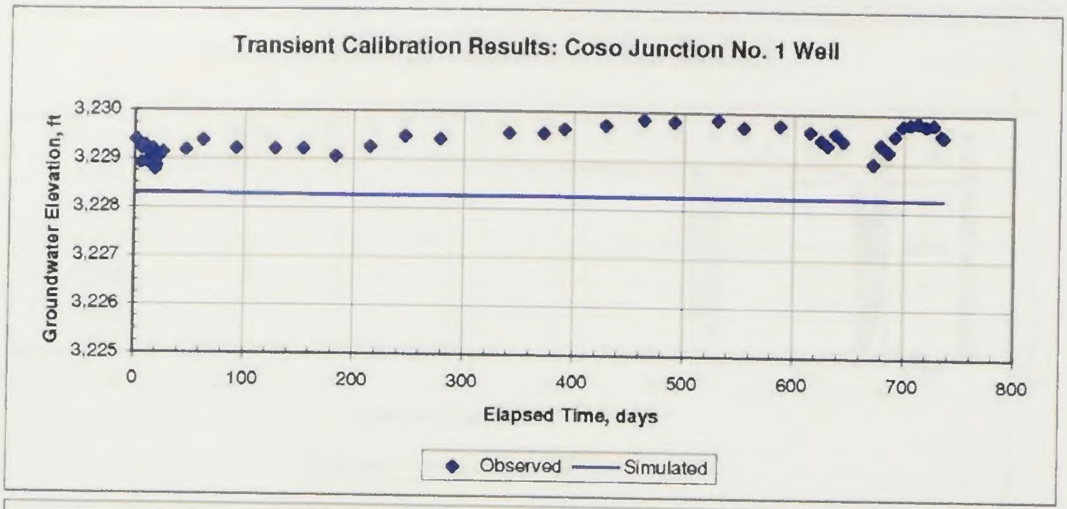
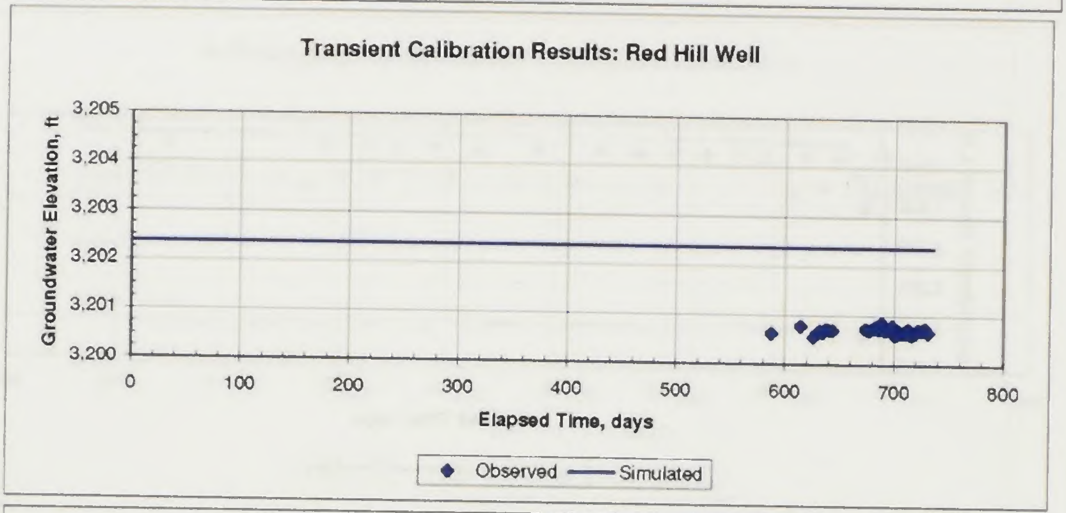


Figure G-9-2: Transient Calibration Results (continued)





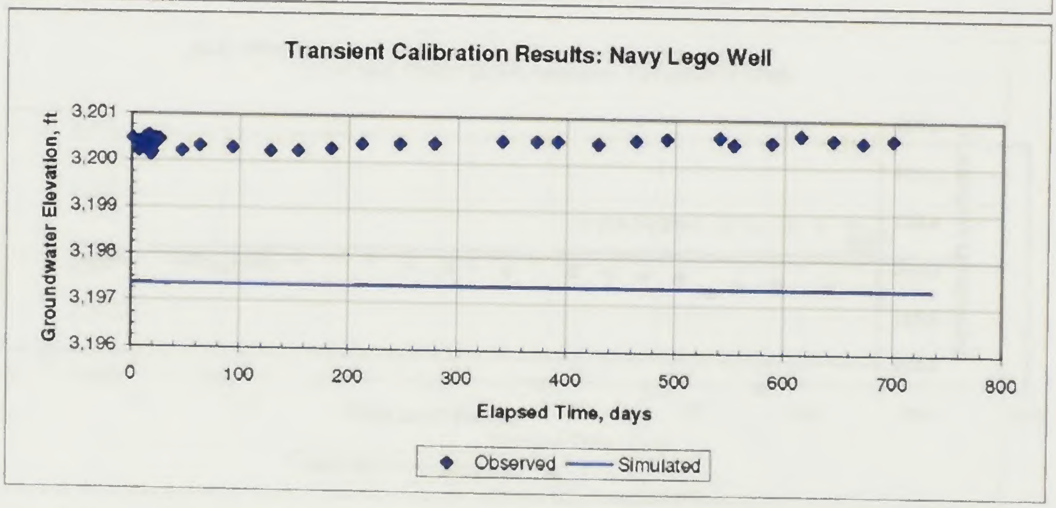
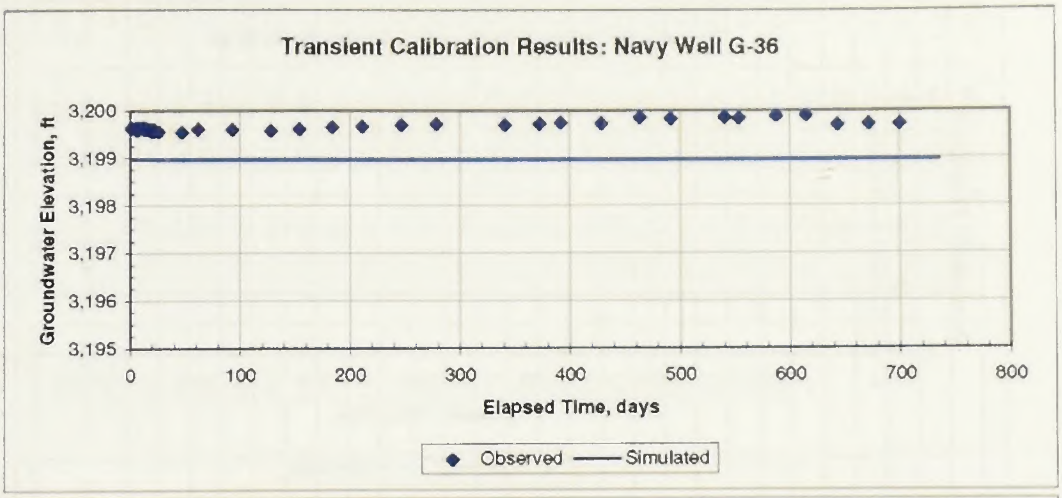
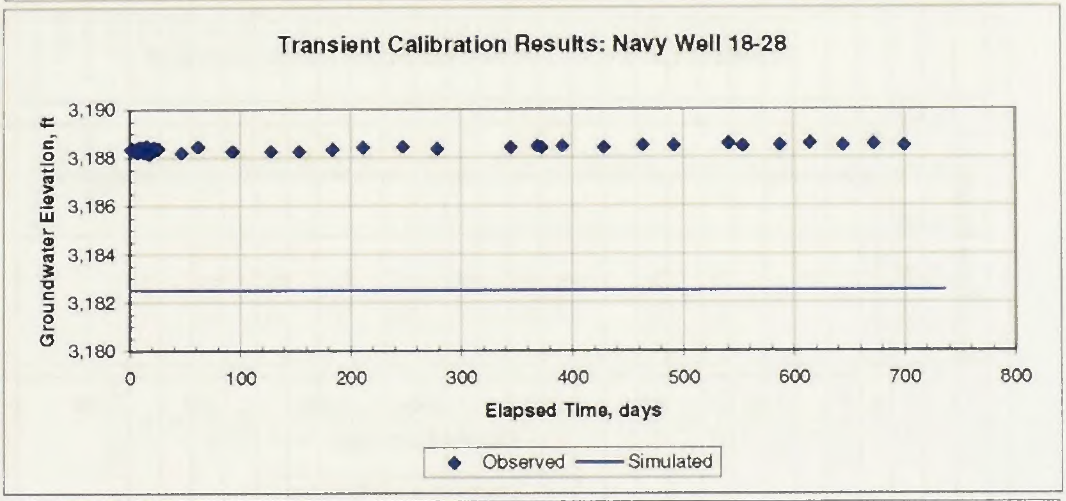


Figure G-9-3: Transient Calibration Results (continued)





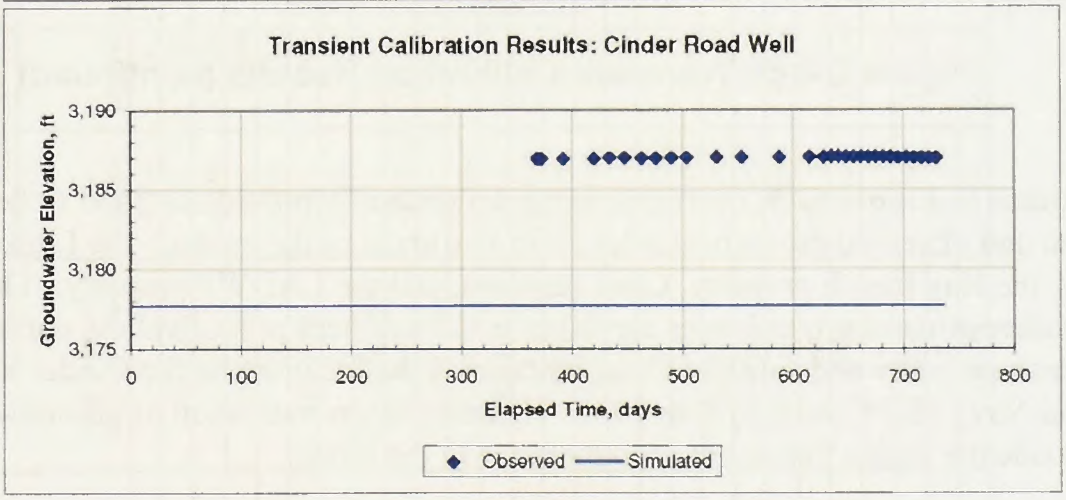
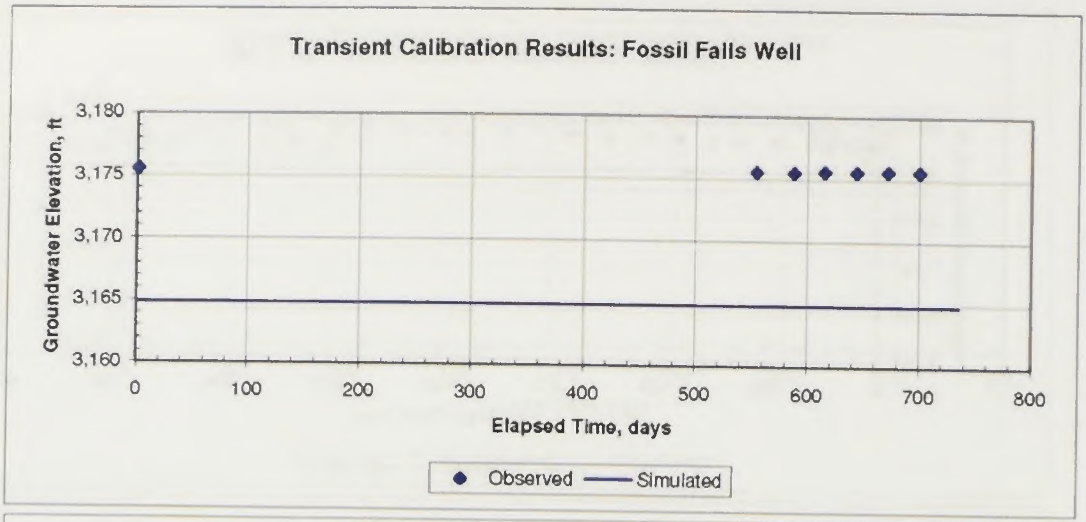


Figure G-9-4: Transient Calibration Results (continued)



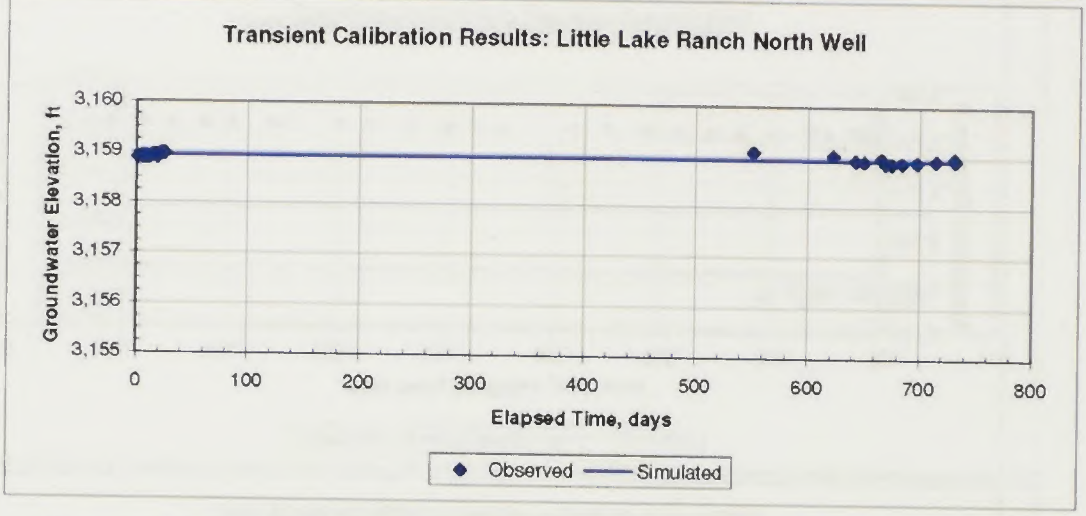


Figure G-9-5: Transient Calibration Results (continued)

As illustrated in **Figure G-9**, the transient model generally provides a good fit between simulated and observed groundwater levels in key areas of the model – the Little Lake Ranch property, the Hay Ranch property, Coso Junction, and the LADWP property. The transient model underestimates groundwater elevation in the southern part of valley, north of the Little Lake Ranch property and south of Coso Junction at the locations of the Cinder Road, Fossil Falls, and Navy 18-28 wells by 6 to 10 ft. This may be an indication of groundwater inflow from outside the valley that is not accounted for in the model.

G3.3.3. Parameter Sensitivity Analysis

Input parameter sensitivity analysis was conducted to evaluate the sensitivity of the fit between observed and simulated groundwater elevation values in the steady-state and transient model calibration runs to uncertainty in the model input parameters. Parameters tested, the range of parameter values used for sensitivity analysis, and estimated parameter sensitivity reported as the Sum of Squared Residual Differences between observed and simulated groundwater elevations at selected monitoring wells are summarized in **Table M-6**, and graphically depicted in **Figures G-5** and **G-6** for the steady-state and transient calibration models, respectively.

Table M-6: Summary of Individual Parameter Sensitivity Analysis Results

Parameter	Final Calibrated Parameter Value	Parameter Values for Sensitivity Analysis				Steady-State Model Sensitivity Analysis Results: Sum of Residual Squared Differences			Transient Model Sensitivity Analysis Results: Sum of Residual Squared Differences		
		Multiplier	Low Value	High Value	Units	Residual from Lower Parameter Value	Residual from Higher Parameter Value	Residual from Final Parameter Value	Residual from Lower Parameter Value	Residual from Higher Parameter Value	Residual from Final Parameter Value
Northern Boundary Kh	2	+/-25%	1.5	2.5	ft/day	233	216	224	2.34E+04	1.77E+04	1.87E+04
Northern Boundary Kh/Kz	10% (0.02)	+/-10	0.002	0.2	-	215	220	224	1.83E+04	1.79E+04	1.87E+04
V816 to Pumice Well Kh	0.24	+/-10%	0.216	0.26	ft/day	409	722	224	3.76E+04	4.44E+04	1.87E+04
V816 to Pumice Kh/Kz	10% (0.024)	+/-10	0.0024	0.24	-	211	238	224	1.79E+04	1.95E+04	1.87E+04
Hay Ranch Transition Kh	7.5	+/-25%	5.6	9.4	ft/day	159	271	224	1.56E+04	2.11E+04	1.87E+04
Hay Ranch Transition Kh/Kz	10% (0.75)	+/-10	0.075	7.50	-	224	230	224	2.13E+04	1.90E+04	1.87E+04
Central Valley Kh L1	50	+/-10%	45	55.00	ft/day	168	408	224	2.13E+04	3.06E+04	1.87E+04
Central Valley L1 Kh/Kz	0.2% (0.001 ft/day)	+/-10	0.0001	0.010	-	234	221	224	1.98E+04	1.91E+04	1.87E+04
Central Valley Kh L2	12.8	+/-10%	11.52	14.08	ft/day	177	301	224	1.78E+04	2.32E+04	1.87E+04
Central Valley L2 Kh/Kz	0.2% (0.01 ft/day)	+/-10	0.001	0.10	-	215	212	224	1.91E+04	1.87E+04	1.87E+04
Southeastern Kh	100	+/-25%	75.0	125.0	ft/day	228	496	224	3.44E+04	3.70E+04	1.87E+04
Southeastern Kh/Kz	10% (10)	+/-10	1	100.0	-	210	226	224	1.82E+04	1.88E+04	1.87E+04
Volcanics Kh	1	+/-25%	0.75	1.25	ft/day	217	231	224	1.84E+04	1.90E+04	1.87E+04
Little Lake Kh	112.5	+/-25%	84.4	140.6	ft/day	353	630	224	2.81E+04	4.38E+04	1.87E+04
Little Lake Kh/Kz	10% (11.25)	+/-10	1.13	112.5	-	206	227	224	1.75E+04	1.89E+04	1.87E+04
Southeast General Head Boundary Elevation	3,140	+/-10 ft	3,130	3,150	ft	401	177	224	4.74E+04	2.33E+04	1.87E+04
Southeast General Head Boundary Conductance	367	+/-25%	275.3	458.8	ft2/day	205	559	224	2.70E+04	3.95E+04	1.87E+04
Little Lake Drain Boundary Elevation	3,110	+/-10 ft	3,100	3,120	ft	401	212	224	2.92E+04	1.64E+04	1.87E+04
LittleLake Drain Boundary Conductance	6.60E+05	+/-25%	5.0E+05	8.3E+05	ft2/day	223	224	224	1.87E+04	1.87E+04	1.87E+04
Northern Boundary Specified Flux	107,088	+/-10%	96,379	117,797	cfd	890	350	224	5.44E+04	2.53E+04	1.87E+04
Sierra Recharge	500,560	+/-10%	450504	550616	cfd	1320	419	224	9.92E+04	5.25E+04	1.87E+04
Northern Sy	0.035	0.01 - 0.1	0.01	0.1	-	--	--	--	3.05E+04	2.38E+04	1.87E+04
Northern Ss	3.50E-06	+/-10	3.50E-07	3.50E-05	1/ft	--	--	--	1.87E+04	1.87E+04	1.87E+04
Central Sy	0.1	0.01 - 0.2	0.01	0.2	-	--	--	--	1.97E+04	1.87E+04	1.87E+04
Central Ss	1.50E-06	+/-10	1.50E-07	1.50E-05	1/ft	--	--	--	1.96E+04	2.16E+04	1.87E+04
Southern Sy	0.1	0.01 - 0.2	0.01	0.2	-	--	--	--	1.87E+04	1.87E+04	1.87E+04
Southern Ss	3.50E-06	+/-10	3.50E-07	3.50E-05	1/ft	--	--	--	1.87E+04	1.87E+04	1.87E+04

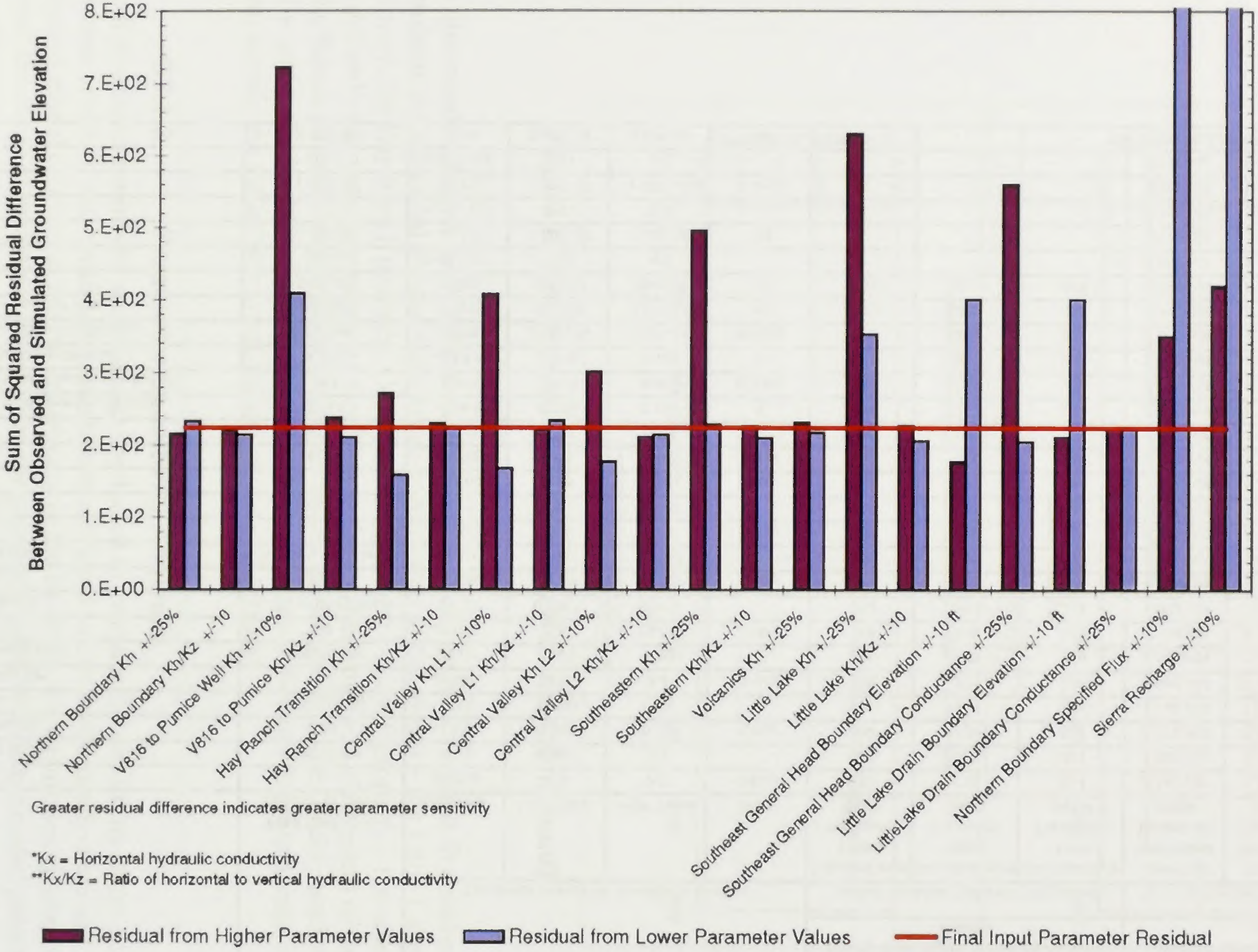


Figure G-10: Summary of Steady-State Model Recalibration Input Parameter Sensitivity Analysis

- **Steady-State Model Sensitivity to Input Parameters** – The steady-state model was found to be most sensitive to specified flux parameters including the flux across the northern boundary of the model (Northern Boundary Specified Flux) and recharge from the Sierra Nevada mountain range (Sierra Recharge on Figure G-10). The steady-state model is relatively highly sensitive to the horizontal hydraulic conductivity (Kh) in the low permeability region between the LADWP property and Pumice Mine well (V816 to Pumice Mine Kh on Figure G-10), central valley horizontal hydraulic conductivity in layer 1, and Little Lake are horizontal hydraulic conductivity, and then the elevations specified for the drain cells and general head boundary cells in the south and southeast portions of the model grid.

- **Transient Model Sensitivity to Input Parameters** – The transient model was also found to be most sensitive to specified flux parameters including the flux across the northern boundary of the model (Northern Boundary Specified Flux) and recharge from the Sierra Nevada mountain range (Sierra Recharge on Figure G-11). The transient model was similarly sensitive to horizontal hydraulic conductivity in generally the same regions as the steady-state model. Neither model was very sensitive to vertical hydraulic conductivity, however, most of the monitoring well data is from wells screened near the water table, or wells that essentially fully penetrate the aquifer, so there is insufficient monitoring data to fully assess this parameter. Likewise, the transient model is relatively insensitive to aquifer storage properties. This is also mostly an artifact of the data available to calibrate the model which consists of three short pumping periods in the LADWP and Hay Ranch wells, with relatively steady water levels in the rest of Rose Valley the remainder of the calibration period (November 2007 to November 2009).

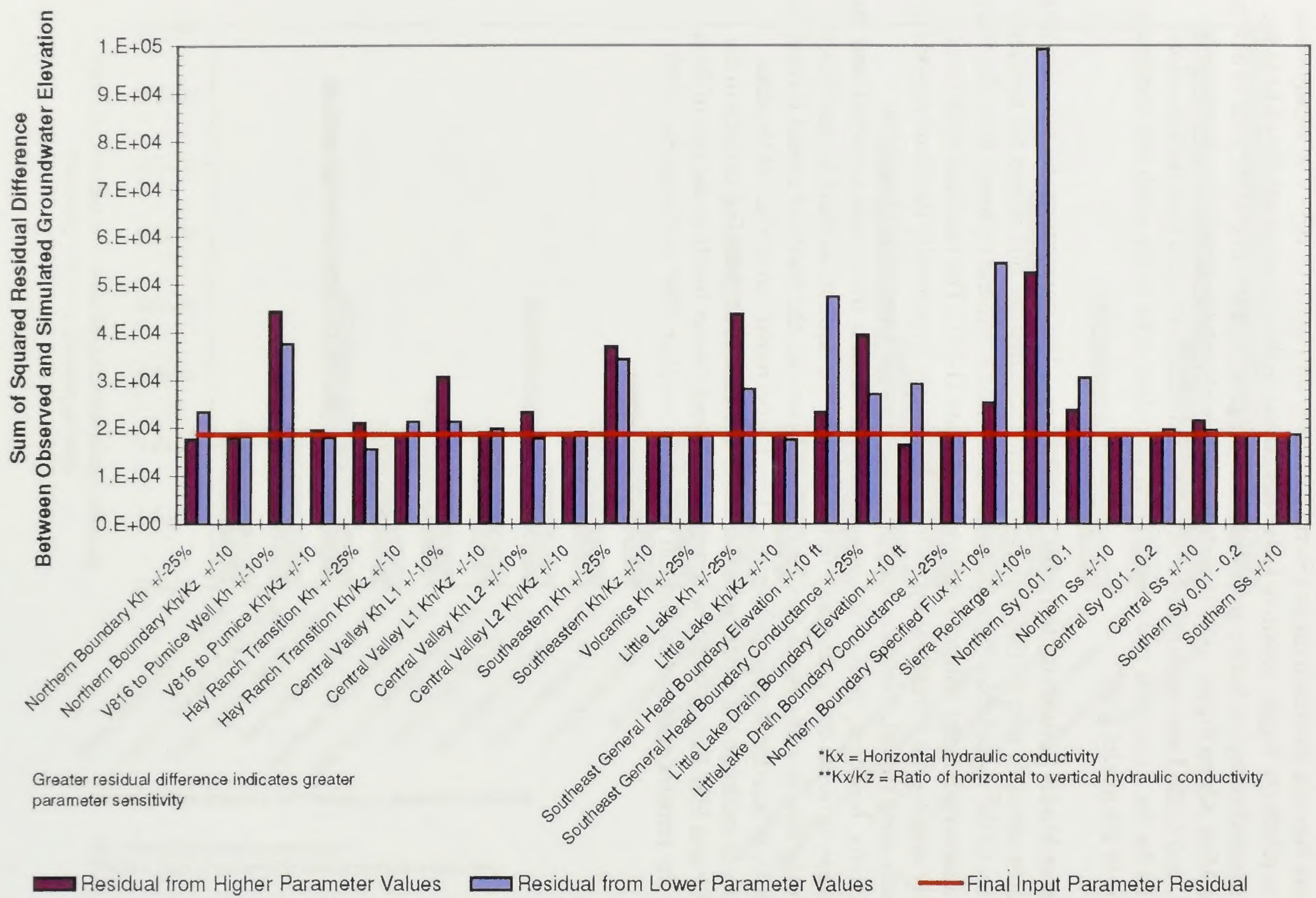


Figure G-11: Summary of Transient Model Recalibration Input Parameter Sensitivity Analysis

G4. GROUNDWATER DEVELOPMENT IMPACT EVALUATION

This section describes procedures used to evaluate potential impacts of groundwater development associated with development of geothermal resources within the Haiwee Geothermal Leasing Area. Groundwater impacts associated with short-term groundwater extraction for well drilling, dust control, and minor operations and maintenance are unlikely to persist, or extend more than a short distance from wells used to supply these purposes. However, based on the analysis presented in the Hay Ranch Groundwater Extraction Project EIS (RMT, 2008), long-term groundwater extraction to support geothermal reservoir development has significant potential for impacting groundwater resources in Rose Valley. In the course of operation of a typical geothermal power plant, high temperature fluids are extracted from the geothermal reservoir, piped through a generator set to generate electricity, and then cooled and condensed for reinjection into the reservoir. During the cooling cycle, a portion of the extracted fluid is lost by evaporation, consequently, more fluid is extracted from the geothermal reservoir on an annual basis than is available to re-inject, leading to a gradual decline in reservoir pressures, and a concomitant loss in electrical generating capacity.

Haizlip (2010) estimated that the water required to provide 100% injection of produced geothermal fluids (aka zero net withdrawal by mass from the reservoir) is equivalent to the fluid lost during power generation under the proposed development scenarios and is approximately 1,450 gallons per minute (gpm), or as much as 2,340 acre-ft per year (ac-ft/yr) for a typical 30 MWe dual flash geothermal power plant. This estimate assumes that 100% of the fluid lost during evaporative cooling would be made-up and reinjected along with the condensate and waste brine by the addition of locally produced. Reinjection of less water than is produced from the geothermal reservoir may result in a gradual reduction in reservoir pressures and/or geothermal fluid yield, and as a consequence result in a gradual reduction in the quantity of steam available to generate power from the initial wells. However, most geothermal reservoirs have experienced pressure decline, most geothermal reservoir pressure decline is managed by a combination of injection and make-up drilling. With new wells and injection management, many geothermal reservoirs have produced for decades without 100% injection.

The rate of pressure decline would presumably be reduced with greater rates of injection. The rate of reduction in geothermal fluid availability with declining reservoir pressure is dependent on reservoir properties, the degree of development relative to the size and sustainable yield of the geothermal reservoir, and the rate of natural recharge of the geothermal reservoir. As these characteristics have not been determined for the Rose Valley geothermal lease area, the water needed to mitigate reservoir decline was estimated to provide zero net withdrawal from the reservoir.

For the Haiwee Geothermal Leasing Area EIS, the assumption was made that up to two 30 MWe dual geothermal power plants would be constructed within the Haiwee Action Area. As no specific development plans have been identified as yet, the main purpose of the analysis described below was to assess whether or not groundwater extraction to augment geothermal fluid injection, and thus bolster geothermal reservoir pressures, could be conducted at any location(s) within the Haiwee Action Area. Based on the unique hydrogeologic setting of Rose Valley, and existing groundwater uses, potential impacts from long-term groundwater extraction can be broadly classified into two categories: impacts to existing water supply wells related to possible increased depth to groundwater or reduced well yield; and, impacts to the sensitive surface water features at the Little Lake Ranch property at the south end of the valley.

G4.1. Evaluation Procedures

Transient groundwater flow simulations were conducted to evaluate the impacts of potential long-term groundwater extraction to augment geothermal fluids. Input parameters from the recalibrated transient numerical model of Rose Valley described in Section G3 were used to run a series of simulation scenarios to forecast potential impacts on groundwater elevation and groundwater quantity. Starting groundwater elevations and boundary conditions were set equal to the final values from the transient calibration model representing groundwater elevations in Rose Valley in November 2009. Pumping from existing domestic, commercial and light industrial supply wells was specified as described for the transient calibration model. Pumping on the LADWP and Hay Ranch properties was not simulated in these analyses. A timeline for the LADWP groundwater development project to capture seepage from the South Haiwee Reservoir has not been established. Pumping for the Hay Ranch Groundwater Extraction Project began in December 2009 (Harrington, 2010) at an initial rate of approximately 700 gpm (1,130 acre-ft/yr); however, a schedule for implementation of the planned operation at 1,859 gpm (3,000 acre-ft/yr) allowed by the Conditional Use Permit for the project has not been established. Consequently, the following discussion pertains to groundwater extraction for the geothermal development project, only.

The cumulative impact of multiple groundwater development projects is more or less additive, that is, if one extraction well causes ten feet of drawdown at a particular location, two wells will likely produce double that amount of drawdown. The timing of cumulative impacts will of course be dependent on the pumping schedule for individual projects, the location of the individual extraction wells relative to sensitive receptors, and the extraction rate of each extraction well. The cumulative impact resulting from augmenting geothermal reservoir pressures, and conducting either or both the LADWP's proposed seepage capture project and the Hay Ranch Groundwater Extraction Project are not evaluated here, but can reasonably be assumed to be greater than the impacts of any individual project.

Because of the unique hydrogeologic conditions that exist in Rose Valley, previous studies (RMT, 2008) found that some amount of groundwater table drawdown resulting from long-term groundwater extraction may persist for a period after pumping is stopped, and, that for locations more distant from the extraction well, the time of maximum drawdown effects may occur after the active pumping period for a project ends. Therefore, drawdown impact forecasts were conducted with varying numbers of extraction wells (one or two) and several different locations (north or south in the Haiwee Action Area) to assess potential impacts of different potential development scenarios. In addition, 200 year long numerical simulations were conducted to assess the magnitude of maximum impacts and their timing relative to the active extraction period.

Two groundwater development scenarios associated with geothermal development were considered:

G4.1.1. Scenario 1 – Extraction to Replace 100% of Lost Fluid

For this scenario, numerical groundwater flow model simulations were conducted to evaluate the potential groundwater resource impacts that might develop in the event that groundwater was extracted to provide water to support injection at rates comparable to 100% of the average annual geothermal fluid loss rate. Extraction was assumed to occur continuously for the 30 year geothermal project lifespan. Several sub-scenarios were evaluated including:

- Extraction from one well at a rate of 2,340 acre-ft/yr to support one 30 MWe dual flash geothermal power plant at the north end of the proposed BLM geothermal lease area, approximately 3 miles from north of Coso Junction (1 plant north);
- As above, but from an extraction well at the south end of the proposed BLM geothermal lease area, approximately 1-1/4 miles south of Coso Junction (1 plant south);
- Extraction from two wells at a total rate of 4,680 acre-ft/yr to support two 30 MWe dual flash geothermal power plants at the north end of the proposed BLM geothermal lease area, approximately 3 miles north of Coso Junction (2 plants north);
- As above, but from two extraction wells located at the south end of the proposed Haiwee Action Area, approximately 1-1/4 miles south of Coso Junction (2 plants south).

G4.1.2. Scenario 2 – Sustainable Extraction at Rate Unlikely to Impact Little Lake

For this scenario, numerical groundwater flow model simulations were conducted to evaluate the groundwater extraction rate that could be sustained for a geothermal project lifespan without causing excessive drawdown or capturing groundwater needed to support surface water features and riparian habitat at the south end of Rose Valley on the Little Lake Ranch property. This criterion was adapted from the Hay Ranch Groundwater Extraction Project Hydrologic Monitoring and Mitigation Plan (HMMP), RMT (2008) which determined that drawdown from groundwater extraction in Rose Valley could not be allowed to cause a greater than 10% reduction in groundwater flow towards the Little Lake Ranch property to avoid causing significant and potentially irreversible impacts to surface water features on the property. For this evaluation, numerical simulations were conducted in iterative fashion to evaluate the maximum groundwater extraction rate that could be sustained for a 30 year project life, without causing a greater than 10% reduction in groundwater flow towards the Little Lake Ranch property. Two sub-scenarios were evaluated including:

- Groundwater extraction at the north end of the Haiwee Action Area, approximately 3 miles north of Coso Junction; and,
- Groundwater extraction at the south end of the Haiwee Action Area, approximately 1-1/4 miles south of Coso Junction.

G4.2. Potential Drawdown Impacts

G4.2.1. Predicted Impacts from Pumping at Full Augmentation Rate

The predicted drawdown impacts of pumping at the full rate needed to augment a geothermal reservoir due to operation of one (1) or two (2) 30 MWe power plants are illustrated in **Figures G-12** and **G-13**, respectively. **Figure G-14** illustrates potential impacts of groundwater development to augment the geothermal reservoir on groundwater flow available to the surface water features at the Little Lake Ranch property at the south end of the valley.

In the north and central parts of Rose Valley, the primary impact to existing or proposed water wells is the reduction in water levels (drawdown) resulting from extraction for geothermal reservoir augmentation. The magnitude of potential impacts depends on the amount of extraction and the location of extraction relative to the property of interest. The drawdown induced by wells operated to support geothermal reservoir augmentation could make some wells unusable without deepening and increase well lift, and thereby increase energy costs for pumping, or reduce well yields. Predicted drawdown near the LADWP property at the north end of the valley may be as little as 10 ft for a single geothermal augmentation well situated at the south end of the Haiwee Action Area, which is predicted to increase to as much as 40 ft if two geothermal augmentation wells were situated at the north end of the Haiwee Action Area.

Predicted drawdown near the Dunmovin community, which has a number of private domestic supply wells, was similarly predicted to range from over 10 ft for a single geothermal augmentation well situated at the south end of the Haiwee Action Area, to greater than 70 ft if two geothermal augmentation wells were situated at the north end of the Haiwee Action Area. Well construction details for wells in the Dunmovin area are not available, but the latter impact scenario would likely impact a number of wells in that area.

Predicted drawdown near Coso Junction, which has several currently active water supply wells, was predicted to range from approximately 20 ft for a single geothermal augmentation well situated at the south end of the Haiwee Action Area, to greater than 50 ft if two geothermal augmentation wells were situated at the south end of the Haiwee Action Area (map not shown). Wells serving the Coso Junction Store (Coso Junction #2) and the Coso Ranch (Coso Ranch South) might not need to be deepened as a result of these impacts, but would likely experience greater pumping costs due to increased lift requirements, and possibly reduced yield.

The effects of simultaneous groundwater extraction on the Hay Ranch property for the Hay Ranch Extraction and Delivery System project to augment geothermal reservoir recovery at the Coso Geothermal Field are not considered in this forecast; however, pumping effects would be additive, consequently greater impacts would occur if both projects extracted groundwater in Rose Valley.

Groundwater extraction to support geothermal reservoir augmentation could also reduce the amount of groundwater available to sustain surface water features on the Little Lake Ranch property. As shown on Figure G-14, all of the scenarios evaluated in which continuous pumping at rates of 1,450 gpm or 2,340 acre-ft/yr from each well for 30 years, result in a reduction in groundwater flow towards Little Lake. The reduction in groundwater flow is greater for two wells (supporting two geothermal power plants) and greater for extraction wells located closer to Little Lake. However, in all cases, the predicted reduction in groundwater flow exceeds the threshold of 10 percent identified as protective of Little Lake surface water features in the Hay Ranch Groundwater Extraction Project Hydrologic Monitoring and Mitigation Plan (HMMP) prepared by MHA (2008). That is, supplying groundwater for 100% injection (zero net withdrawal) requiring operation of one geothermal reservoir augmentation well for the 30 year project life would likely reduce groundwater flow to Little Lake by greater than 10 percent potentially causing adverse impacts to surface water features on the property.

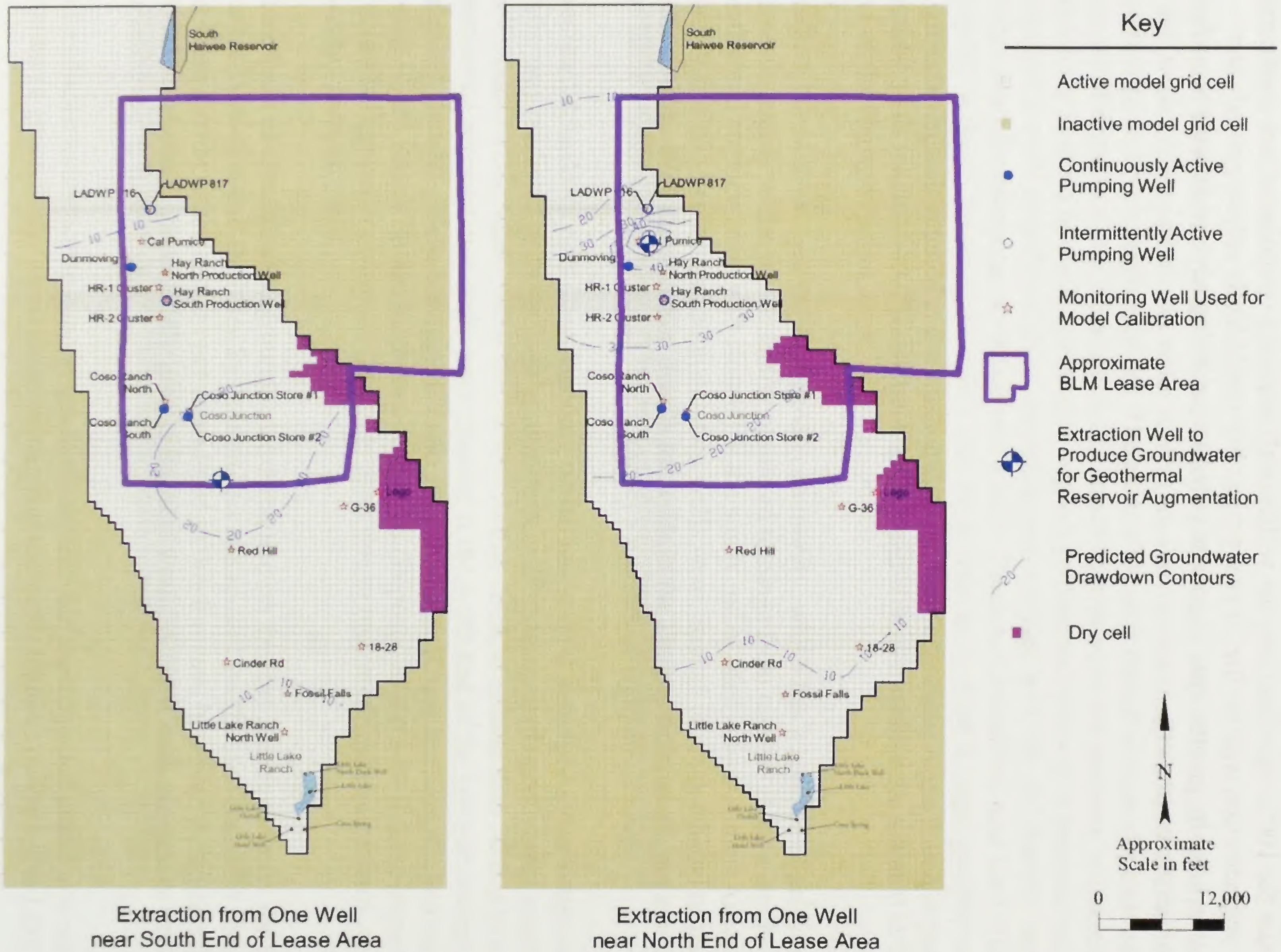


Figure G-12: Potential Drawdown from Pumping One Well for Geothermal Augmentation at 2,340 acre-ft/yr

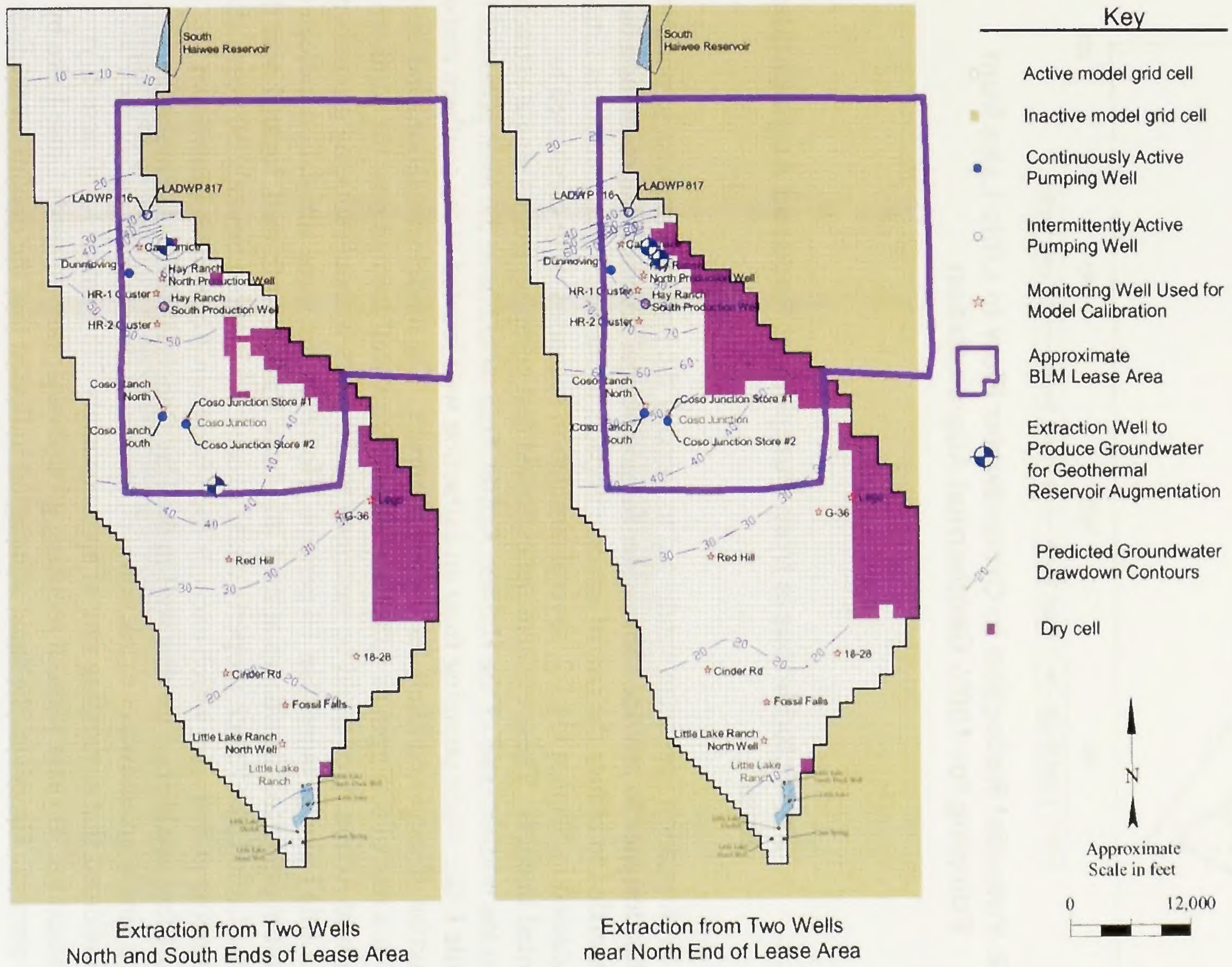


Figure G-13: Potential Drawdown from Pumping Two Wells for Geothermal Augmentation at 4,680 acre-ft/yr

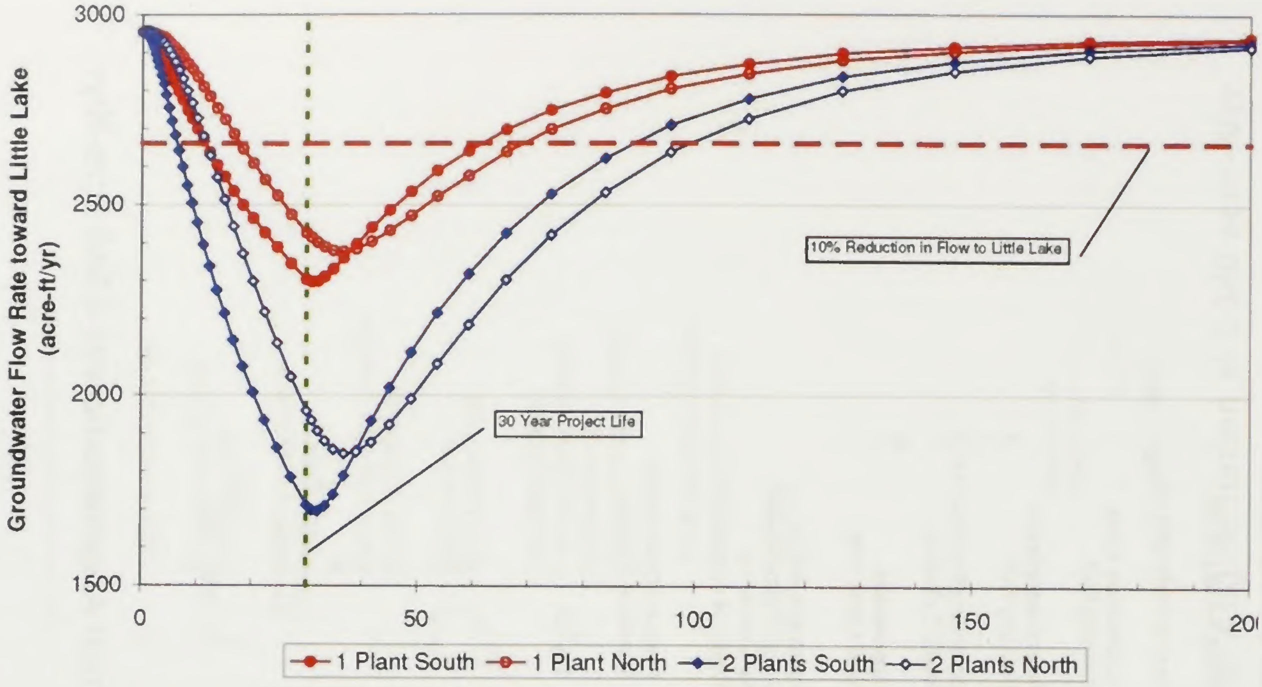


Figure G-14: Potential Reduction in Groundwater Flow to Little Lake from Pumping for 100% Geothermal Augmentation

G4.2.2. Predicted Impacts from Pumping at Reduced Augmentation Rate

For Scenario 2, simulation runs were conducted to forecast the potential impacts of pumping at reduced rates designed to provide some water for geothermal reservoir augmentation but specifically intended to reduce the risk of adverse impacts to surface water features at Little Lake. As discussed in Section G4.1.2, several simulation scenarios were conducted to forecast potential impacts. These evaluations indicated that pumping from a single extraction well located at the northern end of the Haiwee Action Area would have the least potential for impacting Little Lake, while pumping from an extraction well located at the southern end of the Haiwee Action Area would likely have greater impact. The model simulations indicated that pumping at a rate of 625 gpm or 1,000 acre-ft/yr from a well located near the southern end of the Haiwee Action Area could be sustained for 30 years without reducing groundwater flow towards Little Lake by more than 10 percent. However, the same simulation indicated that the maximum predicted drawdown at the Little Lake Ranch North well, located near the north end of the Little Lake Ranch property could exceed 3.5 ft approximately 30 years after the start of pumping at that rate, which exceeds the Maximum Acceptable Drawdown threshold of 0.4 feet established for this well in the Hay Ranch HMMP. A simulation scenario with a single groundwater extraction well located at the northern end of the Haiwee Action Area indicated that a pumping rate of approximately 715 gpm or 1,150 acre-ft/yr could be sustained for 30 years without reducing groundwater flow towards Little Lake by more than 10 percent. However, the same simulation indicated that the maximum predicted drawdown at the Little Lake Ranch North well, located near the north end of the Little Lake Ranch property could exceed 3.5 ft approximately 30 years after the start of pumping at that rate, which also exceeds the Maximum Acceptable Drawdown threshold of 0.4 feet established for this well in the Hay Ranch HMMP. Consequently, lower pumping rates may be required to meet both the groundwater flow and drawdown thresholds established in the Hay Ranch HMMP for protection of surface water features at Little Lake. As was noted in the previous section, the effects of other major groundwater development projects in Rose Valley, including the Hay Ranch Groundwater Extraction and Transfer project and the LADWP's proposed Haiwee Reservoir seepage capture project are not included in this analysis; however, the effects of additional pumping are expected to be additive, with greater impact resulting from higher combined pumping rates or pumping durations.

G5. REFERENCES CITED

Bauer, 2002, "The Hydrogeology of Rose Valley and Little Lake Ranch, Inyo County, California", Master's thesis, California State University at Bakersfield, 150p.

Bloyd and Robson, 1971, "Mathematical Ground-water model of the Indian Wells Valley, California", U.S. Geological Survey Open-File report 72-41.

Brown and Caldwell, 2006, "Rose Valley Groundwater Model", Coso Operating Company, LLC, Rose Valley, California, April 10, 2006.

CWRCB, 1993, "Draft Environmental Impact Report for the Review of Mono Basin Water Rights of the City of Los Angeles. 1993. California State Water Resources Control Board, Division of Water Rights, 901 P Street, 3rd Floor, Sacramento, CA 95814. Prepared by: Jones & Stokes Associates, Inc., 2600 V Street, Suite 100, Sacramento, CA., May 1993.

Danskin, 1998, "Evaluation of the Hydrologic System and Selected Water-Management Alternatives in the Owens Valley, California", U.S. Geological Survey Water-Supply Paper 2370, Chapter H.

Environmental Simulations, 2007, Guide to Using Groundwater Vistas, Version 5.

Geologica, 2008, "Numerical Groundwater Flow Modeling, Rose Valley, Inyo County, California, in MHA, 2008.

GeoTrans, 2003, "Results of Aquifer Tests, Hay Ranch Production Wells, Rose Valley, Coso Junction, California", (report), prepared for Coso Operating Company, LLC, October 13, 2003.

GeoTrans, 2004, Revised Hydrological Conceptual Model for the Rose Valley, proprietary report for Coso Operating Company.

Harrington, R., 2010, Personal communication via email, Operator's Log for Hay Ranch South Well, February 3, 2010.

Haizlip, Jill R., 2010, Personal communication, January 28, 2010.

LADPS, 1916, "Complete Report on Construction of the Los Angeles Aqueduct, with Introductory Historical Sketch", Department of Public Service of the City of Los Angeles, 1916.

LADWP, 2009, "Pumping Test of Well V817 in Rose Valley", Los Angeles Department of Water and Power, June 9, 2009.

McDonald, M. G. and Harbaugh, A. W., 1988, "A modular three-dimensional finite-difference ground-water flow model", Technical report, U.S. Geol. Survey, Reston, VA.

MHA, 2008, Coso Operating Company Hay Ranch Water Extraction and Delivery System, Conditional Use Permit (CUP 2007-003) Application, SCH# 2007101002, Draft EIR, Inyo County, California, Prepared for: Inyo County Planning Department Prepared by: MHA Environmental Consulting, an RMT Business, July 2008.

Inyo Co., 2009, 2010, Coso/Hay Ranch Hydrologic Monitoring, at http://www.inyowater.org/coso/default.html, accessed December 20, 2009 and January 28, 2010.

Rockwell, 1980, "Project: Geology and Hydrology Technical Report on the Coso Geothermal Study Area, In Support of: Coso Geothermal Development Environmental Statement, prepared by Rockwell International, for U.S. Bureau of Land Management, April 1980.

SGSI, 2009a, "Summary of Well Construction Operations Groundwater Monitoring Well "COC-BLM", Coso Operating Company, BLM Property, Rose Valley, Inyo County, California, July 11, 2009.

SGSI, 2009b, "Summary of Well Construction Operations Groundwater Monitoring Well HR1B, Coso Operating Company, Hay Ranch Property, Rose Valley, Inyo County, California, July 11, 2009.

SGSI, 2009c, "Summary of Well Construction Operations Groundwater Monitoring Well HR2B, Coso Operating Company, BLM Property, Rose Valley, Inyo County, California, July 11, 2009.

Thompson, 1929, "The Mojave Desert Region, California." U.S. Department of Interior Water Supply Paper 578, p. 144-170.

U.S.G.S., 2009, "Environmental Assessment for the Coso Operating Company Hay Ranch Water Extraction and Delivery System, CA Bureau of Land Management, December 2008", Comments by the U.S. Geological Survey, June 4, 2009.

Weiss, 1979, "Hydrologic Evaluation for Geothermal development- an Example at COSO Hot springs, California.", in Expanding the Geothermal Frontier, Transactions Volume 3, Geothermal Resources Council Annual Meeting, 24-27 September 1979, Reno, Nevada.

Williams, 2004, "Hydrogeologic and Hydrochemical Framework of Indian Wells Valley, California: Evidence for Interbasin Flow in the Southern Sierra Nevada", Master's Thesis, Colorado School of Mines, 206p.

THIS PAGE INTENTIONALLY LEFT BLANK.

APPENDIX H

Scoping Report

February 2010

Haiwee Geothermal Leasing Area Scoping Report

PROJECT NUMBER:
118242
PROJECT CONTACT:
KAREN CADAVONA
EMAIL:
KAREN.CADAVONA@POWERENG.COM
PHONE:
714 507-2700

POWER ENGINEERS

United States Department of the Interior
Bureau of Land Management

Haiwee Geothermal Leasing Area
Scoping Report

Inyo County, California

PREPARED FOR: BLM

PREPARED BY: POWER ENGINEERS, INC.
731 E. BALL ROAD, SUITE 100
ANAHEIM CA 92805
(714) 507-2700
WWW.POWERENG.COM

REVISION HISTORY		
DATE	REVISED BY	REVISION
12-18-09	K. Cadavona	Rev 0
03-02-12	P. Godfrey	Rev1

TABLE OF CONTENTS

TABLES:

FIGURES:

APPENDICES:

1.0 INTRODUCTION

The Department of the Interior, Bureau of Land Management (BLM) is proposing the leasing of geothermal resources within the Haiwee Geothermal Leasing Area located in Inyo County, California for geothermal exploration, development, and utilization. The proposed action is to: 1) open or close leasing of 22,460 acres of BLM-managed lands; 2) approve or reject pending lease applications for 4,460 acres; and 3) amend the California Desert Conservation Area (CDCA) Plan to allow Haiwee Geothermal Leasing Area lands to be leased under the authority of the Geothermal Steam Act of 1970, as amended (30 U.S.C. 1001 *et seq.*).

The Haiwee Geothermal Leasing Area is approximately 13 miles south of Olancha, California, to the east of the Inyo National Forest, west of the China Lake Naval Weapons Center, and south of the South Haiwee Reservoir. The Haiwee Geothermal Leasing Area encompasses a total of 24,320 acres. The BLM manages 22,460 acres (4,460 acres containing three pending applications for non-competitive leasing and 18,000 acres of lands for competitive leasing), the State Lands Commission manages 640 acres (Section 16), and 1,220 acres are privately owned. The BLM-managed lands considered for geothermal leasing are located in the Mount Diablo Meridian and occupy the following 37 sections that are illustrated in Figure 1:

Township 21 South, Range 37 East, Sections 11-14, 23-26, 35-36
Township 21 South, Range 38 East, Sections 7-10, 15, 17-22, 27-34
Township 22 South, Range 37 East, Sections 1-2, 11-12
Township 22 South, Range 38 East, Sections 5-8

The approval to issue geothermal leases represents a commitment of resources that may have indirect environmental impacts for subsequent exploration, development, and production. The BLM will prepare an Environmental Impact Statement (EIS)/Proposed Plan Amendment in compliance with the National Environmental Policy Act (NEPA) to identify, analyze, and disclose potential environmental effects of leasing geothermal resources.

Scoping must be conducted both internally with appropriate BLM staff, and externally with interested and potentially affected public, agencies, tribes, and organizations (40 CFR 1501.7). This Scoping Report summarizes the public scoping effort, and documents issues and concerns expressed during scoping of the Haiwee Geothermal Leasing Area Draft EIS/Proposed Plan Amendment.

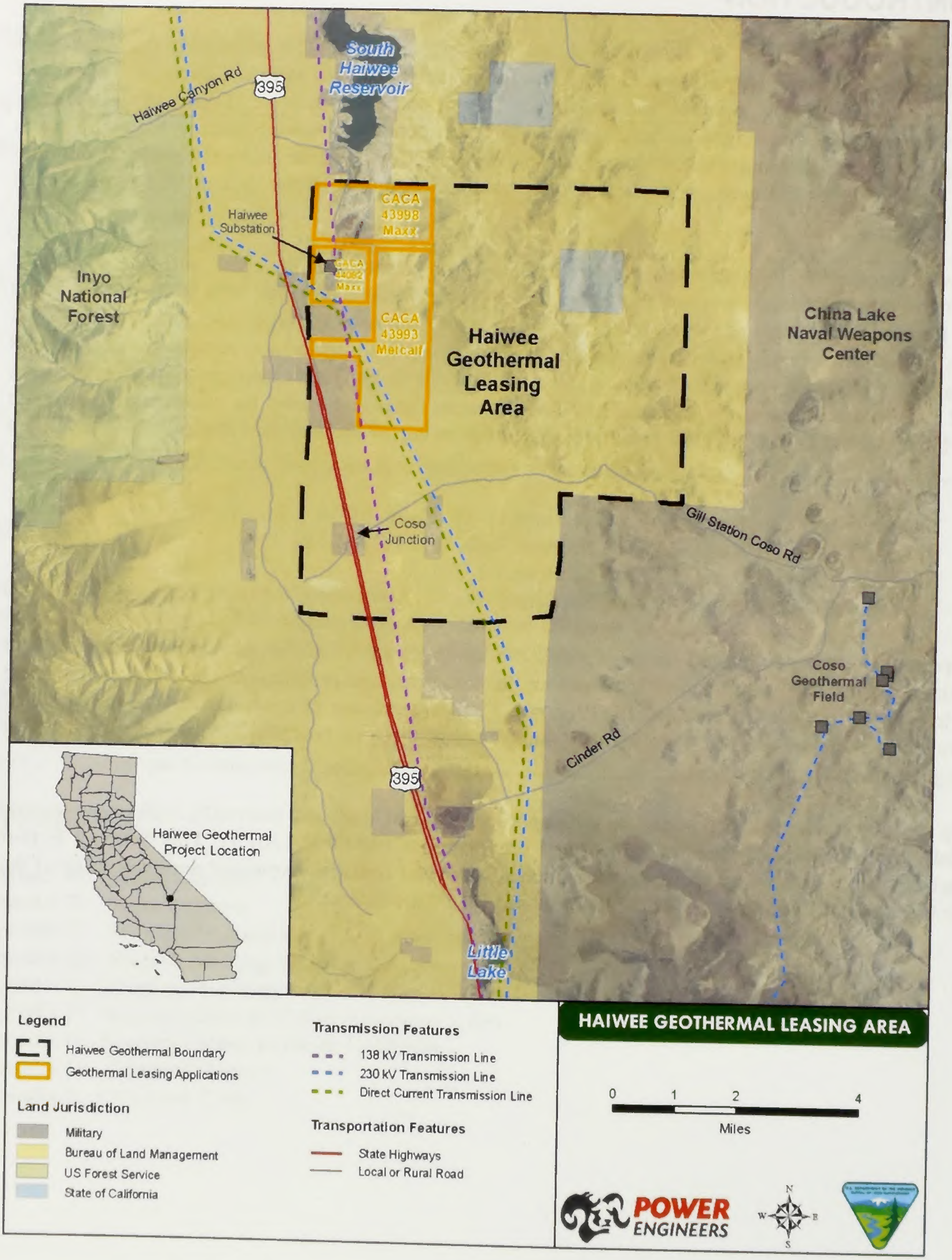


Figure 1 Haiwee Geothermal Leasing Area Map

2.0 SCOPING

Scoping is an early and open process for determining the scope of issues to be addressed, identifying the significant issues, and allowing regulatory agencies and the public an opportunity to comment on the proposed action (40 CFR 1501.7).

2.1 NOTICE OF INTENT

To comply with NEPA 40 CFR 1508.22, on September 11, 2009, the BLM published a Notice of Intent (NOI) to prepare an EIS for the Haiwee Geothermal Leasing Area in the *Federal Register*, Volume 74, Number 175 (See Appendix A). The *Federal Register* is the official daily publication for rules, proposed rules, and notices of federal agencies and organizations.

The NOI initiated the public scoping period for the EIS/Plan Amendment and described the Haiwee Geothermal Leasing Area and plan amendment, alternatives, and environmental review process. It also identified preliminary issues and concerns, and contacts. The notice served as an invitation for other federal agencies to provide comments on the scope and content of the EIS/Plan Amendment and requested all comments be received by October 13, 2009.

2.2 NEWS RELEASES

The BLM distributed three news releases to agency representatives, elected officials, Native American Tribes, the media, or interested parties and organizations. The news releases and associated distribution lists are found in Appendix B. The September 11, 2009 news release announced the times and locations of the public scoping meetings in Lone Pine, Bishop and Ridgecrest, California. It also listed issues to be analyzed in the EIS, and contact information. A second news release was issued on October 1, 2009 announcing the addition of the Death Valley scoping meeting date, time, and location. A third news release was issued on July 28, 2011 to clarify and affirm that three pending lease applications would be analyzed in the EIS.

2.3 SCOPING MEETINGS

The BLM conducted four public scoping meetings from October 13 to 20, 2009 in Lone Pine, Bishop, Ridgecrest and Death Valley, California, with a total of 32 attendees. Table 1 lists the dates, locations, and number of attendees for each of the meetings. The scoping meetings provided an opportunity for the BLM to share information regarding the Haiwee Geothermal Leasing Area, plan amendment, and the decision-making processes, and to listen to public and agency views on the range of issues and alternatives to be considered during the preparation of the Draft EIS/Plan Amendment.

The meetings began with a brief presentation by the BLM discussing the Haiwee Geothermal Leasing Area and alternatives, geothermal resources, and the environmental review process. A copy of the presentation and information boards may be found in Appendix C. A question and answer session followed to allow agency representatives, elected officials, Native American Tribes, interested parties and organizations to ask questions and provide comments. A list of topics discussed at each of the meetings and the court reporter transcripts may be found in Appendix D.

Table 1 Scoping Dates and Locations

Date	Location	Number of Attendees
Tuesday, October 13, 2009 5:30 – 9:00 p.m.	Boulder Creek RV Resort 2550 S. Hwy 395 Lone Pine, CA	7
Wednesday, October 14, 2009 5:30 - 9:30 p.m.	Eastern Sierra Fairgrounds Home Economics Bldg Sierra Street & Fair Drive Bishop, CA	12
Thursday, October 15, 2009 5:30 - 9 p.m.	Kerr-McGee Center 100 W. California Ave Ridgecrest, CA	10
Tuesday, October 20, 2009 10:00 a.m. to 1:30 p.m.	Timbisha Shoshone Tribal Office 900 Indian Village Rd Death Valley, CA	3

2.3.1 Scoping Handouts

All attendees were given a scoping package that contained a fact sheet, map, and comment form. The fact sheets informed the public about the proposed action, geothermal resources, the purpose and need for the Haiwee Geothermal Leasing Area EIS, and the environmental review process, and provided contact information. Copies of the following were also made available: Notice of Intent, news releases, Haiwee Geothermal Leasing Area Specifications and Acreage, and Geothermal Resource Leasing Regulations (43 CRF 3200). Attendees also received notification of the extension of the scoping period to November 9, 2009 to allow commenters and attendees at the Death Valley scoping meeting sufficient time for commenting. Appendix E contains copies of all the scoping handouts.

3.0 CONSULTATION AND COORDINATION

3.1 NATIVE AMERICAN TRIBES

The BLM will use the NEPA commenting process to satisfy the requirements for public involvement process for Section 106 of the National Historic Preservation Act (16 U.S.C. 470f) as provided for in 36 CFR 800.2(d)(3). Native American Tribal consultations will be conducted and Tribal concerns will be given due consideration, including impacts on Indian trust assets.

On October 7, 2009, the BLM sent letters via certified mail to the following Native American Tribes inviting them to participate in the scoping and consultation process: Bishop Paiute Tribe, Big Pine Paiute Tribe, Ft. Independence Paiute Tribe, Lone Pine Paiute-Shoshone Tribe, and Timbisha Shoshone Tribe. The letter discussed the Haiwee Geothermal Leasing Area and location, NEPA process, scoping locations, and contact information. Appendix F contains a representative letter to the Tribes.

3.2 AGENCIES

Approximately 200 federal, state, and local agencies were sent news releases inviting them to the Haiwee Geothermal Leasing Area scoping meetings (see Section 2.2). The news release also identified preliminary issues and concerns for the project, as well as contact information.

3.3 ELECTED OFFICIALS

Inyo County Supervisors were sent scoping letters inviting them to participate in the scoping process for the Haiwee Geothermal Leasing Area. The letter also describing the proposed action, NEPA process, scoping, preliminary resource management issues and concerns, and schedule. A representative copy of the letter may be found in Appendix H and Table 2 lists the recipients and their districts.

Table 2 Inyo County Supervisors and Representative Districts

Inyo County Board of Supervisors	Representative District
Linda Arcularius	District 1
Susan Cash	District 2
Beverly Brown	District 3
Marty Fortney	District 4
Richard Cervantes	District 5

4.0 SCOPING COMMENT SUMMARY

BLM received 14 comment letters and numerous oral comments during the scoping meetings. Copies of the comment letters may be found in Appendix I. A list of topics discussed at each of the meetings and the court reporter transcripts may be found in Appendix D. To assist the BLM, comments were summarized and categorized by resource issue (see Appendix J) to determine the scope and significant issues that will be analyzed in the Draft EIS. A summary of the comments is provided below.

Purpose and Need

The public was concerned about the potential impacts of geothermal exploration, development, and utilization. They requested that the reasonable foreseeable development scenario be included in the purpose and need section and that it identify suitable and non-suitable locations for geothermal resources. The public and agencies inquired about the anticipated amount of generation, the power plant type and lifespan, and cooling methods. Many commenters requested the quantity of water needed, and its source, be identified. It was also suggested that the water amounts required for each phase and the water needs for the various power plant cooling designs be described. To address potential cumulative impacts, the identification of mitigation measures and establishment of mitigation funds was also requested.

A discussion of the Plan Amendment to the CDCA Plan in regards to the Geothermal Programmatic EIS and Haiwee Geothermal Leasing Area was requested. The public, agencies, organizations, and Native American Tribes were also interested in the relationship of the Haiwee Geothermal Leasing Area to the Deep Rose Geothermal Exploration Project and the three pending lease applications, as well as the connection to Coso Geothermal Fields.

The public, agencies, organizations, and Native American Tribes were concerned about the level of environmental analysis for the EIS and questioned if additional analysis would occur for specific projects in the Haiwee Geothermal Leasing Area.

Alternatives

It was recommended that a reasonable range of alternatives, including the no action alternative, be analyzed. An organization suggested a smaller leasing area be considered to avoid sensitive wildlife species and their habitats. It was suggested that alternative designs of geothermal facilities and conservation of geothermal resources be considered. Some examples are a geothermal power plant that would eliminate or vastly reduce water needs, or a means to capture and treat wastewater. It was suggested that alternative sources of water be identified, such as the Ridgecrest Treatment Plant, the Los Angeles Department of Water and Power, the Indian Wells Water Basin, construction of new water entrapment programs, and conservation and recycled water. There was also concern regarding the lack of a competitive bidding process for leasing of government lands for other renewable energy development, such as solar and wind, and multiple uses of the land.

Air Quality

Consideration of potential impacts caused by windborne dust and pollution, carbon dioxide emissions, and impacts to air quality in Rose Valley, were recommended. It was also suggested that any contributions to non-attainment areas be addressed, and greenhouse gases and global warming be analyzed.

Biological Resources

There is concern for the potential loss of water resources in Rose Valley and the potential impacts it may cause to habitat and vegetation, especially to the Little Lake Ranch property, wetlands adjacent to U.S. Highway 395, and the Habitat Project at Little Lake. There is also concern regarding water level impacts to surface flora and fauna. A baseline study was requested to analyze the potential impacts of surface water to a functional ecosystem. Analysis of riparian habitats, sensitive natural communities, natural springs, and artesian wells throughout the Rose Valley was also suggested.

The Haiwee Geothermal Leasing Area is within the Mohave Ground Squirrel Habitat Management Area and the Rose Valley Habitat Management Area. There is concern over the loss of habitat, the availability of suitable habitat compensation, and the compatibility of geothermal leasing and associated activities within the habitat management area. Of particular concern are the Mohave Ground Squirrel and Desert Tortoise. A member of the public also requested that impacts to vegetation, animals, and insects be addressed. Coordination with the California Department of Fish and Game was requested.

Cultural Resources

The Haiwee Geothermal Leasing Area is an intersection of more than one tribe's territory and there is concern regarding the involvement of all interested tribes and the potential for cultural differences. A member of the public requested that a qualified archaeologist identify interested tribes for the proposed action, and actively solicited for comments, with personal contact and formal notices. It was also recommended that the archaeologist also collect and analyze comments from those tribes.

The Native American Tribes requested additional involvement. They are concerned about the Section 106 Consultation process, extraction of resources from the land, and what types of benefits the Tribes would obtain from the proposed action. Some local tribes requested additional information regarding geothermal leasing of lands to the Tribes. The Timbisha Shoshone Tribe was especially concerned about the connections or impacts to the Coso Hot Springs, and the water table depth.

The Tribes were also concerned that the new power plants would require transmission lines and these facilities could prohibit access and conflict with Native American values. They noted that impacts affecting Native American values are not amenable to mitigation and may involve desecration or sacrilegious treatment of spiritually important sites.

Geothermal Resources

Organizations requested that the existence of the geothermal resource, and its size and composition, be identified. It was also questioned if the Haiwee Geothermal Leasing Area was within a known geothermal resource area (KGRA), such as Coso, and if viable geothermal resources were present. It was requested that the amount of electrical production from geothermal resources be based upon the size and extent of the reservoir. It was requested that the preservation of the geothermal reservoirs and long-term management be addressed. Commenters also requested the identification of the different types of fluids that are contained in a GeoReservoir (both liquid and steam) and the fluids re-injected.

The public was concerned about the seismic activity in the area and questioned if geothermal exploration and development contributed to increased seismic activity. They questioned if injection of water into the rocks would contribute to fracturing. United States Geological Survey (USGS) coordination was also requested.

The public was concerned that depletion of underground water basins and surface flows may have a profound effect upon soil erosion, loss of topsoil, and the capability of the surface to sustain life, and they requested examination of potential soil subsidence in Rose Valley. It was requested that potential impacts on geologic resources and seismic issues related to high-pressure injection of fluids directly into fault zones be addressed. If water cooling towers (WCTs) are utilized, the public requested that the dramatic loss of heated liquids from evaporation be addressed.

There was concern regarding potential impacts to the Coso Geothermal Power Plant and operations, as well as the Coso Hot Springs. The public, agencies, organizations, and Native American Tribes were interested in the Deep Rose Geothermal Exploration Project and the three pending lease applications (CACA 43998 Maxx, CACA 44082 Maxx, and CACA 43993 Metcalf). They inquired about the cumulative impacts of numerous geothermal projects (existing and future) in close proximity to the Haiwee Geothermal Leasing Area.

Hazards and Hazardous Materials

There was concern regarding the potential for hazardous substance generation by future development in the Haiwee Geothermal Leasing Area, and treatment and disposal of substances. An analysis of wastewater and emission hazards to the public, and potential impacts from heat emissions, was requested.

Land Use / Agriculture / Recreation

The Haiwee Geothermal Leasing Area is within or in close proximity to a number of desert management plans—the California Desert Conservation Area (CDCA), the Northern and Eastern Mojave (NEMO) Plan, and the West Mojave (WEMO) Plan. The public, agencies, organizations, and Native American Tribes are concerned about the relationship of these plans to the Haiwee Geothermal Leasing Area and potential land use conflicts.

The Haiwee Geothermal Leasing Area contains motorized recreational roads and the public is concerned about access and potential impacts to recreation. They also requested mitigation for loss of roads from the NEMO planning decision. There is also concern regarding agricultural operations in Rose Valley and the potential impacts to water well owners.

Noise and Electromagnetic Fields (EMF)

An organization requested evaluation of noise generation from development in the Haiwee Geothermal Leasing Area, noise levels, and potential impacts to workers and surrounding wildlife.

Public Health & Safety

The public is concerned about potential impacts to human health and safety, and requested that the potential for wastewater and emission hazards to the public be analyzed.

Socioeconomics

Inyo County inquired about the potential for creation of jobs and revenue generation for the County. Concern arose regarding the CDCA Plan causing delays to geothermal leasing and potential impacts to the County's economy. The County requested consideration of the potential impacts to population and housing, and potential for socioeconomic impacts or adverse impacts to the Coso Geothermal Power Plant.

Traffic and Transportation

The California Department of Transportation was concerned about potential highway transportation issues to US 395, such as highway access points for facilities, and transport of construction materials and workforce.

Utilities & Public Services

The public questioned if adequate electrical transmission was available to transfer the geothermal energy to the load centers, and inquired about plans to upgrade existing transmission lines or construct a substation.

Visual Resources

The Rose Valley contains a number of recreational uses, and there is concern regarding visual impacts from the construction of structures and geothermal facilities.

Water Resources

The public, agencies, organizations, and Native American Tribes are concerned about the increasing scarcity of water in California, especially in Rose Valley. Most of the comments received inquired about the water needs for geothermal energy development and production, and questioned the source and amount of water appropriations. They requested that local and imported water sources for injection, the natural replenishment and adequacy of the water supply, and inter-basin water transfers in the vicinity be addressed.

The Rose Valley residents are very concerned about any potential reductions to water resources and the protection of watersheds, water rights, and nearby public lands. The owners of Little Lake Ranch, a 1,200 acre property located on the southern end of the Rose Valley, utilize the property for wildlife habitat and wildlife-oriented recreation, including hunting, fishing, and wildlife viewing. The propertyincludes a navigable body of water known as "Little Lake," ponds, and wetlands. Owners of Little Lake Ranch property requested potential impacts to subsurface water, aquifers, wetlands, water table depth, Little Lake, downstream ponds, creeks, wetlands, water wells, and natural springs be addressed. They requested consideration of water withdrawals impacts to arid environments that would affect many desert species, from fish to bighorn sheep to rare plants that depend on the water resources. The analysis of potential adverse impacts to BLM-administered lands at Little Lake, specifically to the Little Lake Watchable Wildlife Areas, was requested.

The public inquired about the presence of a connection between the GeoReservoir and the water basins, and requested evaluation of potential impacts to the use and consumption of the GeoReservoirs on local water basins. The Native American Tribes are also concerned about the close proximity of the Coso Hot Springs to the Haiwee Geothermal Leasing Area, and potential impacts to the hot springs. There was concern for the short- and long-term impacts of water extractions. It was requested that long-term pumping studies be completed prior to issuance of any permits.

Cumulative Effects

Many commenters were concerned about the cumulative impacts from existing and proposed geothermal projects, Deep Rose and Coso Geothermal Fields. There was also concern regarding large-scale operations in the vicinity of the Haiwee Geothermal Leasing Area, such as LADWP operations, Owens Lake Dust mitigation, water exports by Coso Hay Ranch, and livestock grazing. They are especially concerned about the increasing scarcity of water in California and the needs for groundwater extraction by these projects. The public is concerned that the development scenario is relatively small and may underestimate potential cumulative impacts and future projects and development. Cumulative effects should include an inventory and analysis of the following: wetlands (all springs and seeps), regional hydrology, vegetation, wildlife, rare plant and animal species, geology, aesthetic/scenic values, recreation, and dust generation.

In addition to geothermal energy development, an evaluation of potential cumulative impacts of future permitting for solar and wind energy development was requested. A commenter also requested identification of a menu of mitigation measures to be utilized at specific triggers to address potential cumulative impacts.

BLM also has a number of management plans in the desert (i.e., CDCA, NEMO, and WEMO) and the public questions how these plans would affect the proposed action.

Other Comments

The Native American Tribes, Inyo County planners, and local agencies requested additional coordination and notification of the Haiwee Geothermal Leasing Area. There was also concern regarding the *Federal Register* notice containing non-functional website links and the different scoping period end dates on the press releases. A commenter also questioned BLM's ability and capacity to manage and monitor geothermal activity without impacting its other responsibilities.

A comment was received that questioned a lease applicant's experience and knowledge of geothermal resource exploration and development, and financial capability.

Consideration of previous studies, reports, evidence, and comments prepared for projects, such as the Coso Project, was suggested. An organization also requested production of public records in connection with the Haiwee Geothermal Leasing Area.

5.0 SUMMARY OF FUTURE STEPS IN THE PLANNING PROCESS

Comments received during the public scoping period will be considered during the preparation of the Draft EIS. Although the public scoping period has ended (November 9, 2009), the BLM welcomes comments throughout the environmental review process. The release of the Draft EIS/Draft Plan Amendment is expected to commence in spring of 2010 and begin the 90-day comment period. Shortly after the release, the public will also have the opportunity to attend formal public meetings. The Final EIS/Proposed Plan Amendment is expected in fall of 2010, and the BLM anticipates issuance of a Record of Decision in winter 2010.

Table 3 Haiwee Geothermal Leasing Area EIS Timeline

Scoping • Scoping Comments due November 9, 2009	Fall 2009
Draft Environmental Impact Statement/Draft Plan Amendment • Publish Notice of Availability • 90-day comment period • Formal Public Meetings	Summer 2010
Final Environmental Impact Statement/Proposed Plan Amendment • Publish Notice of Availability • 30-day protest period • 60-day Governor's Consistency Review	Fall 2010
Record of Decision	Winter 2010

Appendix A: Federal Register

Dated: September 8, 2009.

Rhea Suh,

Assistant Secretary—Policy, Management and Budget.

[FR Doc. E9–21930 Filed 9–10–09; 8:45 am]

BILLING CODE P

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

[LL91310000EI]

Notice of Intent To Prepare an Environmental Impact Statement for the Proposed Leasing of National System of Public Lands for Geothermal Resource Development in the Haiwee Geothermal Leasing Area Located in Inyo County, CA and To Amend the California Desert Conservation Area Plan of 1980

AGENCY: Bureau of Land Management, Interior.

ACTION: Notice of Intent.

SUMMARY: In compliance with the National Environmental Policy Act of 1976 (NEPA), as amended, and section 202 of the Federal Land Policy and Management Act of 1976 (FLPMA), as amended, the Bureau of Land Management (BLM) Ridgecrest Field Office intends to prepare an Environmental Impact Statement (EIS) to analyze the proposed leasing of approximately 22,060 acres of BLM-managed public lands for geothermal exploration, development, and utilization in the Haiwee Geothermal Leasing Area located in Inyo County, California. The leasing of public lands for geothermal resources will require an amendment to the California Desert Conservation Area (CDCA) Plan of 1980. Comments are being solicited to help identify significant issues or concerns related to the proposed action, determine the scope of issues, and identify and refine alternatives to the proposed action. The BLM will also use and coordinate the NEPA commenting process to satisfy the requirements for public involvement in section 106 of the National Historic Preservation Act.

DATES: This Notice initiates the public scoping process for the EIS and plan amendment. Comments on issues may be submitted in writing until October 13, 2009. The date(s) and location(s) of the public scoping meetings will be announced at least 15 days in advance through local news media, newspapers and the BLM Web site at: *http://www.blm.gov/ca/st/en.html*. In order to be included in the Draft EIS, all comments must be received prior to the close of the scoping period or 15 days after the last public meeting, whichever is later. We will provide additional opportunities for public participation upon publication of the Draft EIS.

ADDRESSES: You may submit comments related to Geothermal Leasing in the Haiwee Geothermal Leasing Area located in Inyo County, California by any of the following methods:

- *Web site: http://www.blm.gov/ca/st/en.html.*
- *E-mail: John_Dalton@ca.blm.gov.*
- *Fax:* (951) 697–5299.
- *Mail:* Bureau of Land Management, California Desert District Office, Attn: John Dalton, Haiwee Geothermal Leasing Area Coordinator, 22835 Calle San Juan De Los Lagos, Moreno Valley, California 92553.

FOR FURTHER INFORMATION CONTACT: John Dalton at (951) 697–5311, *John_Dalton@ca.blm.gov.*

SUPPLEMENTARY INFORMATION: The BLM has received three noncompetitive geothermal lease applications for 4,460 acres of public land within the Haiwee Geothermal Leasing Area in Inyo County, California. In addition, the BLM identified approximately 17,600 acres of public lands, also within the Haiwee Geothermal Leasing Area and adjacent to the three geothermal lease applications, which will be considered for competitive geothermal leasing under 43 CFR 3203.10(e). The proposed action is to amend the CDCA Plan to allocate project area lands as open or closed to consideration for geothermal leasing, with appropriate stipulations necessary to maintain and protect other resource values and uses, and to develop a Reasonably Foreseeable Development Scenario for geothermal resources development under the authority of the FLPMA and the Geothermal Steam Act of 1970, as amended (30 U.S.C. 1001 *et seq.*). Individual lease issuance decisions and parcels to be included in a sale will be considered in a manner consistent with the final plan as amended, as subsequent implementation decisions. The public lands being considered for geothermal leasing in the Haiwee Geothermal Leasing Area are located in sections 11–14, 23–26, 35, and 36 in Township 21 South, Range 37 East, sections 7–10, 15, 17–22, 27–34 in Township 21 South, Range 38 East, in sections 1 and 2 in Township 22 South, Range 37 East, and sections 5–8 in Township 22 South, Range 38 East, all within the San Bernardino and Base Meridian. Total acreage being considered for geothermal leasing is approximately 22,060 acres.

Alternatives thus far identified for evaluation in the EIS will include the following:

1. Proposed action.
2. No action alternative (not leasing the lands for geothermal exploration, development, and utilization).
3. Leasing fewer than the proposed 22,060 acres of public land.

The principal issues identified thus far for consideration in the EIS include Native American concerns; potential land use conflicts including recreation; cumulative impacts considering existing, proposed, and potential geothermal projects in the area; and potential impacts on cultural resources, wildlife, visual resources, and surface and groundwater resources. The EIS will also address other issues such as geology, mining, geothermal resources, vegetation, threatened or endangered species, air quality, noise, transportation, human health and safety, and social and economic issues, as well as any issues raised during the scoping process.

The BLM will identify issues to be addressed in the Plan, and will place them into one of three categories:

1. Issues to be resolved in the plan.
2. Issues to be resolved through policy or administrative action.
3. Issues beyond the scope of this plan.

The BLM will provide an explanation in the plan as to why we placed an issue in category two or three. The public is also encouraged to help identify any management questions and concerns that should be addressed in the Plan. The BLM will work collaboratively with interested parties to identify the management decisions that are best suited to local, regional, and national needs and concerns.

The following Planning Criteria will be utilized during production of this document:

- The plan will be completed in compliance with FLPMA, NEPA, and all other relevant Federal law, Executive Orders, and management policies of the BLM.
- Where existing planning decisions are still valid, those decisions may remain unchanged and be incorporated into the plan amendment.
- The plans will recognize valid existing rights.
- Native American Tribal consultations will be conducted in accordance with policy and Tribal concerns will be given due consideration. The planning process will include the consideration of any impacts on Indian trust assets.

• Consultation with the State Historic Preservation Officer will be conducted throughout the planning process.

• Consultation with U.S. Fish and Wildlife Service will be conducted throughout the planning process, as necessary.

By this notice, the BLM is complying with requirements in 43 CFR 1610.2(c) to notify the public of potential amendments to land use plans, predicated on the findings of the EIS. The BLM will utilize and coordinate the NEPA commenting process to satisfy the public involvement process for section 106 of the National Historic Preservation Act (16 U.S.C. 470f) as provided for in 36 CFR 800.2(d)(3). Native American Tribal consultations will be conducted in accordance with policy, and Tribal concerns will be given due consideration, including impacts on Indian trust assets. Federal, State, and local agencies, as well as individuals, organizations, or tribes that may be interested or affected by the BLM's decision on this project are invited to participate in the scoping process and, if eligible, may request or be requested by the BLM to participate as a cooperating agency.

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

Jack Hamby,

Acting District Manager.

[FR Doc. E9–21928 Filed 9–10–09; 8:45 am]

BILLING CODE 4310–40–P

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

[LLNVC0100000.L91310000.EJ0000. LXSIGEOT0000; MO4500008734; NVN 087795; 09–08807; TAS: 14X5575]

Notice of Intent To Prepare an Environmental Impact Statement for the Salt Wells Energy Projects, Churchill County, NE

AGENCY: Bureau of Land Management, Interior.

ACTION: Notice of Intent.

SUMMARY: The Bureau of Land Management (BLM) Stillwater Field Office, Carson City, Nevada, intends to prepare an Environmental Impact Statement (EIS) for the Salt Wells Energy Projects proposed by Sierra Pacific Power Company (Sierra), Ormat Technologies, Inc. (Ormat), and Vulcan Power Company (Vulcan) that are located in Churchill County, Nevada. Three separate projects are proposed that could result in seven 30–60 megawatt (MW) geothermal power plants with 47 associated wells, pipelines and other facilities near Fallon, Nevada, and a 22-mile, fifty-foot-wide Right-of-Way (ROW) for a new transmission line with substations to support the existing and new Fallon geothermal power plants. The study area encompassed by the three projects together covers approximately 537 total acres. This notice announces the beginning of the scoping process and solicits input on the identification of issues.

DATES: The public scoping period will close November 10, 2009. Any public meetings associated with the public scoping will be announced through the local news media and the BLM Web site: *www.blm.gov/nv/st/en/fo/carson_city_field.html* at least 15 days prior to each event. Additional formal opportunities for public participation in the EIS process will be provided through comment upon publication of the draft document.

ADDRESSES: Written comments may be submitted by any of the following methods:

• *Mail:* BLM Stillwater Field Office, Attn: Salt Wells Energy Projects, 5665 Morgan Mill Road, Carson City, NV 89701.

• *Fax:* (775) 885–6147.

• *E-mail: saltwells_eis@blm.gov.*

Documents pertinent to this proposal may be examined at the Carson City District Office, 5665 Morgan Mill Road, Carson City, NV.

FOR FURTHER INFORMATION CONTACT: Desna Young (775) 885–6078; or e-mail *saltwells_eis@blm.gov.*

SUPPLEMENTARY INFORMATION: The BLM Stillwater Field Office received separate proposed geothermal utilization plans and applications for facilities construction permits from Ormat and Vulcan, and an electric transmission right-of-way (ROW) application from Sierra, for proposed energy projects covering a combined area of approximately 537 acres in the Salt Wells area about 15 miles east of Fallon, Nevada. Vulcan proposes the development of up to six geothermal power plants and facilities. Ormat proposes the development of one geothermal power plant and associated facilities. Sierra proposes 22 miles of above-ground electrical transmission lines, electrical substations, and switching facilities. The BLM determined that because of similar timing, geographic area, and type of action, the BLM will analyze the three proposals in one EIS. The BLM will issue a separate record of decision at the end of the process for each proposed project. The BLM will use information from this scoping process with the utilization plans and ROW proposals to facilitate public involvement and to identify the alternatives to be studied. All lands within the project area are already under lease. The proposed facilities would be sited on a combination of private property and public land managed by the BLM and the U.S. Bureau of Reclamation (BOR). Several proposed well sites are located on Federal geothermal leases in the Carson Lake and Pasture area, currently open to leasing and managed by the BOR, although these lands have been proposed to be transferred to the Nevada State Department of Wildlife. These activities are consistent with the applicable 2001 Carson City Consolidated Resource Management Plan as amended by the 2008 Record of Decision and Resource Management Plan Amendments for Geothermal Resource Leasing in the Western United States. The Fallon Naval Air Station is adjacent to the leased areas in Salt Wells. The Navy has concerns both related to its own geothermal resource program and also related to preserving its airspace for training, and community encroachment issues. The Ormat project proposal includes the construction and operation of a 40 MW binary air-cooled geothermal power plant, 20 geothermal production and injections wells, pipelines, a substation, connection lines to the proposed Sierra transmission line, and access roads on approximately 90 acres of land. BLM has already completed a July 2008 Environmental Assessment in the Ormat Carson Lake Geothermal Exploration Project EA (EA-NV–030–07–006) and has approved 11 of the wells estimated to be necessary for Ormat's project. The Vulcan project proposal is to construct up to six 30–60 MW binary or double-flash geothermal power plants and associated facilities on approximately 160 acres of land, which could require an estimated 27 geothermal production and injection wells. Each site includes production and injection wells, pipelines, a substation, connection lines to the proposed Sierra transmission line, and access roads. Twenty of these wells have already been approved via two Environmental Assessments for ten

APPENDIX B: NEWS RELEASES

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

News Release

For Immediate Release: September 11, 2009 CA-CDD-09-69
Contact: Stephen Razo 951-697-5217; email: srazo@ca.blm.gov

Public Meetings Scheduled for Proposed Geothermal Project

Three public meetings are scheduled in October to gather public comments on proposed geothermal exploration and development on public lands managed by the Bureau of Land Management within the Haiwee area near Ridgecrest in Inyo County.

The meetings will be held at the following dates, times and locations:
1) Tuesday, Oct. 13, 5:30 pm to 9 pm, Boulder Creek RV Resort, 2550 S. Hwy 395, Lone Pine;
2) Wednesday, Oct. 14, 5:30 pm to 9:30 pm, Ea Sierra Fairgrounds, Home Economics Bldg, Bishop;
3) Thursday, Oct. 15, 5:30 pm to 9 pm, Kerr-McGee Center, 100 W. California Ave, Ridgecrest.

BLM staff will present a brief overview of the proposed project. Following the presentation, BLM will accept public comment, which will be recorded by a court reporter. The timeframe of comments will be determined by the number of individuals who register to speak. Comments received throughout the public process will be considered during preparation of the draft environmental impact statement (EIS).

Written comments should be submitted by October 16, 2009, to the Bureau of Land Management, California Desert District Office, Attn: John Dalton, Haiwee Geothermal Leasing Coordinator, 22835 Calle San Juan De Los Lagos, Moreno Valley, California 92553.

Total acreage being considered for geothermal leasing is approximately 22,060 acres.

Issues already identified to be analyzed in the EIS include hydrology; Native American concerns; cumulative impacts considering existing, proposed, and potential geothermal projects in the area; potential impacts on cultural resources; potential effects on wildlife; potential land use conflicts including recreation; potential visual impacts; and potential impacts on surface water and groundwater resources. The EIS also will address issues such as geology, geothermal resources, vegetation, threatened or endangered species, air quality, noise, transportation, human health and safety and socioeconomics, as well as any issues raised during the public process.

For more information contact John Dalton at (951) 697-5311 or email: John_Dalton@ca.blm.gov. You may also contact Linn Gum, BLM Ridgecrest Field Office assistant manager (760) 384-5450 or the BLM California planning and environmental coordinator (916) 978-4427.

-BLM-

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

News Release

For Immediate Release: October 1, 2009 CA-CDD-10-01
Contact: David Briery (951) 697-5220 or Stephen Razo (951) 697-5217

Additional Public Meeting Scheduled for Proposed Geothermal Project

An additional public meeting to gather comments on the proposed geothermal exploration and development on public lands managed by the Bureau of Land Management (BLM) within the Haiwee area near Ridgecrest in Inyo County has been scheduled for Death Valley.

The meetings will be held at the following dates, times and locations:

1) Tuesday, Oct. 13, 5:30 – 9:00 p.m., Boulder Creek RV Resort, 2550 S. Hwy 395, Lone Pine;
2) Wednesday, Oct. 14, 5:30 - 9:30 p.m., Ea Sierra Fairgrounds, Home Economics Bldg, Bishop;
3) Thursday, Oct. 15, 5:30 - 9 p.m., Kerr-McGee Center, 100 W. California Ave, Ridgecrest;
4) Tuesday, Oct. 20, 10:00 a.m. to 1:30 p.m., Timbisha Shoshone Tribal Office, 900 Indian Village Rd, Death Valley.

BLM staff will present a brief overview of the proposed project. Following the presentation, BLM will accept public comment, which will be recorded by a court reporter. The timeframe of comments will be determined by the number of individuals who register to speak. Comments received throughout the public process will be considered during preparation of the draft environmental impact statement (EIS).

Written comments should be submitted by October 16, 2009, to the BLM California Desert District Office, Attn: John Dalton, Haiwee Geothermal Leasing Coordinator, 22835 Calle San Juan De Los Lagos, Moreno Valley, CA 92553.

Total acreage being considered for geothermal leasing is approximately 22,060 acres.

Issues already identified to be analyzed in the EIS include hydrology; Native American concerns; cumulative impacts considering existing, proposed, and potential geothermal projects in the area; potential impacts on cultural resources; potential effects on wildlife; potential land use conflicts including recreation; potential visual impacts; and potential impacts on surface water and groundwater resources. The EIS also will address issues such as geology, geothermal resources, vegetation, threatened or endangered species, air quality, noise, transportation, human health and safety and socioeconomics, as well as any issues raised during the public process.

For more information contact John Dalton at (951) 697-5311 or email: John_Dalton@ca.blm.gov. You may also contact Linn Gum, BLM Ridecrest Field Office assistant manager (760) 384-5450 or the BLM California planning and environmental coordinator (916) 978-4427.

-BLM-

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

News Release

For Immediate Release: July 28, 2011 CA-CDD-11-57
Contact: David Briery, (951) 697-5220 or Stephen Razo, (951) 697-5217

BLM to Analyze Geothermal Lease Proposals in Inyo County

The Bureau of Land Management (BLM) will analyze three geothermal lease proposals on public lands that are within the Haiwee Geothermal Leasing Area (HGLA) in southwestern Inyo County, northwest of Ridgecrest, Calif.

The BLM is currently writing a draft Environmental Impact Statement (EIS) to evaluate the HGLA, which includes an estimated 22,040 acres of BLM-managed federal lands. The EIS will analyze various alternatives in considering whether none, all, or part of the HGLA should be made available for geothermal exploration and development. In conjunction with this analysis, the BLM will evaluate the three pending lease proposals that total approximately 4,500 acres of federal mineral estate within the area.

The leasing area is east of the Inyo National Forest, west of the China Lake Naval Air Weapons Station, north of Little Lake, and south of the South Haiwee Reservoir.

As part of the ongoing HGLA analysis first announced in September 2009, issues raised during the public scoping process will be addressed. The BLM is also evaluating the potential environmental, social, and economic effects of proposed alternatives. The BLM will use this same EIS and CDCA plan amendment process to evaluate the impacts of the three pending geothermal lease applications.

Following the release of the draft EIS and possible CDCA plan amendment, there will be an opportunity for public comment on the three potential geothermal leases.

For more information contact Peter Godfrey, HGLA Project Manager, California Desert District Office at (951) 697-5385 or email: pgodfrey@blm.gov

-BLM-

Haiwee Geothermal Leasing Area
Agency Contact List

CITY PLANNING DEPT
KERN CITY PLANNING DEPT
APPLE VALLEY WATER DISTRICT
CA ASSOC RESOURCE CONSERVATION DISTRICT
CA BOARD OF EQUALIZATION
CA DEPT OF CORRECTIONS
CA DEPT OF FISH & GAME
CA DEPT OF FISH & GAME REGION 6
CA DEPT OF PARKS & RECREATION
CA DEPT OF TRANSPORTATION
CA DESERT PROTECTION LEAGUE
CA FEDERATION OF MINERALOGICAL SOCITIES
CA PARKS AND RECREATION
CA REG WATER QUALITY CONTOL BOARD
CA REGIONAL WATER CONTROL BRD
CA SECRETARY OF RESOURCES
CA STATE LANDS COMMISSION
CALIFORNIA DEPARTMENT OF FORESTRY
CALIFORNIA DEPARTMENT OF JUSTICE
CALIFORNIA DEPARTMENT OF PARKS AND RECREATION
CALIFORNIA DEPT OF FORESTRY
CALIFORNIA DIVISION OF OIL AND GAS
CALIFORNIA OFFICE OF HISTORIC PRESERVATION
CALIFORNIA STATE LANDS COMMISSION
COACHELLA VALLEY WATER DISTRICT
COMMUNITY SERVICES DISTRICT
DESCANSO RANGER DISTRICT
DESERT DISTRICT GRAZING BOARD
DESERT WATER AGENCY
ENVIRONMENTAL PROTECTION AGENCY
GARRY MEEKER INSURANCE AGENCY
IMPERIAL IRRIGATION DISTRICT
INDEPENDENT OIL PRODUCERS AGENCY
INDIAN WELLS VALLEY WATER DISTRICT
METROPOLITAN WATER DISTRICT
MOJAVE DESERT AIR QUALITY MANAGEMENT DISTRICT
NATIVE AMERICAN HERITAGE COMMISSION
OLIVENHAIN WATER DISTRICT
OTAY WATER DISTRICT
SALTON COMMUNITY SERVICES DISTRICT
SUNLINE TRANSIT AGENCY
TWENTYNINE PALMS WATER DISTRICT
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
US ARMY CORPS OF ENGINEERS
US ARMY ENGINEER DIST SUCCESS LAKE
US ARMY ENGINEER DISTRICT
US BORDER PATROL
US DEPT OF AG SOIL CONSERVATION SVC
US DEPT OF THE INTERIOR
US ECOLOGY
US ENVIRONMENTAL PROTECTION AGENCY REGION 9
US FISH & WILDLIFE SERVICE
US FISH & WILDLIFE SERVICE ENHANCEMENT
US FISH AND WILDLIFE SERVICE
US FOREST SERVICE
US FOREST SERVICE ANGELES NF
US FOREST SERVICE BIG PINES VISITOR CTR
US FWS KERN NWR
US FWS HAVASU NWR
USDA FOREST SERVICE
USFW REGIONAL DIRECTOR
VISTA IRRIGATION DISTRICT
TRIBAL HISTORIC PRESERVATION OFFICER, KERN VALLEY INDIAN COUNCIL
BEATTY TOWN BOARD
CALIFORNIA CONSERVATION CORPS POMONA CENTER
CAMP PENDLETON US MARINE CORP BASE
COLORADO RIVER BOARD OF CALIFORNIA
FLOOD CONTROL DISTRICT RIVERSIDE COUNTY
CLARK COUNTY COMPREHENSIVE PLANNING
COUNTY PLANNING COMMISSION TULARE COUNTY
IMPERIAL COUNTY AGRICULTURE COMMISSION
IMPERIAL COUNTY FISH AND GAME COMMISSION
IMPERIAL COUNTY PLANNING AND DEVELOPMENT SERVICES
DAGGETT COMM SERVICES DIST
DESERT FISHES COUNCIL
DESERT PROTECTION COUNCIL
DESERT PROTECTIVE COUNCIL
IMPERIAL COUNTY PLANNING DEPARTMENT
FISH GAME COMMISSIONER
INYO COUNTY PLANNING COMM
GOVERNOR'S OFFICE OF PLANNING AND RESEARCH

INYO COUNTY PLANNING DEPT
KERN COUNTY PLANNING DEPARTMENT
KERN COUNTY PLANNING COMMN DEVELOPMENT SERVICES
KERN COUNTY PLANNING DEPT
MONO COUNTY PLANNING DEPARTMENT
ORANGE COUNTY PLANNING DEPT
PLANNING COMMISSION RIVERSIDE COUNTY
SAN BERNARDINO COUNTY AGRI COMMISSIONER
SAN DIEGO COUNTY PLANNING AND LAND USE
INDIO PLANNING DEPT
BOARD OF SUPERVISORS KERN COUNTY
COUNTY OF LOS ANGELES
KERN CO WILDLIFE RESOURCES COMMISSION
KERN COUNCIL OF GOVTS
COUNTY ADMINISTRATION CENTER
COUNTY OF RIVERSIDE
COUNTY OF SAN BERNARDINO
COUNTY OF SAN DIEGO
ENVIRON ANALYSIS SECTION SAN BERNARDINO COUNTY
FOURWHEELERS OF ORANGE COUNTY
IMPERIAL COUNTY PARKS AND RECREATION
IMPERIAL COUNTY PARKS AND RECREATION
IMPERIAL COUNTY SHERIFF
IMPERIAL COUNTY SUPERVISOR
KERN COUNTY
KERN COUNTY BOARD OF TRADE
LAKESIDE PLANNING GROUP
KERN COUNTY FARM BUREAU
KERN COUNTY FIRE DEPT
MBR CA BOARD FORESTRY
MINE COUN
KERN COUNTY GENERAL SERVICES
KERN COUNTY PROSPECTORS
NEVADA COMMISSION ON TOURISM
NEWBERRY COMMUNITY SERV DIST
KERN COUNTY PUBLIC WORKS SOLID WASTE MGMT
OFF HIGHWAY MOTOR VEHICLE RECREATION COMMISSION
ORANGE CO PLANNING COMM
ORANGE CO SANITATION DIST
KERN COUNTY SHERIFFS DEPT
LA COUNTY SANITATION DIST
LOS ANGELES COUNTY
ORANGE COUNTY
PALO VERDE IRRIGATION DIST
PLANNING DEPT
PLANNING OFFICE
PLANS AND PROGRAMS AFFTC XP
REGIONAL WATER QUALITY CONTROL BOARD
RIDGECREST PLANNING COMMISSION
RIVERSIDE CO PLANNING COMMISSION
SAN BERNARDINO CO FISH GAME COMMISSION
RIVERSIDE COUNTY
RIVERSIDE COUNTY SHERIFF OFFICE
SAN BERNARDINO COUNTY
SAN BERNARDINO COUNTY COOPERATIVE EXTENSION
SAN BERNARDINO COUNTY DEPT OF REG PARKS
SAN BERNARDINO COUNTY DEPT OF WASTE MGT
SAN BERNARDINO COUNTY ENV ANALYSIS TEAM
SAN BERNARDINO COUNTY SERVICES AREA NO 29
SAN BERNARDINO COUNTY-DEPARTMENT OF AIRPORTS
SAN BERNARDINO COUNTY-DEPARTMENT OF PUBLIC WORKS-
SAN DIEGO COUNTY
SAN DIEGO COUNTY FIRE
SAN DIEGO COUNTY SHERIFF
SBCO CHIEF OF ENVIR DIVISION -- PLANNING
SOUTH DIST SECTYTREAS
STATE BOARD FOOD AG
STATE BOARD OF FOOD AG
SAN DIEGO COUNTY SHERIFFS DEPARTMENT
TLC LOS ANGELES COUNTY
TULARE COUNTY
CALIFORNIA INSTITUTE OF PUBLIC AFFAIRS
COACHELLA VALLEY ASSN OF GOVTS
DEPT OF ADMINISTRATION
DEPT OF AGRICULTURE
DEPT OF ENVIROMENTAL HEALTH
DEPT OF GEOLOGY
DEVELOPMENT DEPT
F D ARCH DEPT
FORESTRY DEPT

GOVERNMENT PUBLICATIONS DEPT
GOVT PUBLICATION SECTION
KERN CO FIRE DEPT
KERN CO HEALTH DEPT
NAVY PUBLIC WORKS CENTER
PUBLIC WORKS
SAN BERNARDINO CNTY DEPT ECONOMIV AND CMNTY DEV
TOIYABE NATIONAL FOREST
TULARE CO ASSN OF GOVTS
US ARMY COE
ARCHAEOLOGICAL INFO CENTER
BAKER COMMUNITY SERVICES DISRTICT
BUREAU OF LAND MANAGEMENT
CA HIGHWAY PATROL
CDFG
CDFG FIELD SUPERVISOR
CENTER FOR NATURAL LANDS MANAGEMENT
CNPS
CO OF ORANGE PARKS RECREATION
DEATH VALLEY NATIONAL PARK
ENVIRONMENTAL POLICY PROGRAM IPR
FEDERAL HIGHWAY ADMIN CENTRAL
FISH AND GAME COMM
FOREST SERVICE
L A DEPARTMENT OF WATER AND POWER
MOJAVE DESERT AQMD
NATIONAL PARK SERVICE
NATIONAL PARK SERVICE WESTERN REGION
NAVAL AIR WEAPONS STATION
PROVIDENCE MTN STATE REC AREA
SAN BERNARDINO CNTY
SAN BERNARDINO CO FARM BUREAU
SAN BERNARDINO CTY
SAN DIEGO CO FISH GAME ASSO
SAN DIEGO DEPARTMENT OF PARKS
SEQUOIA NATIONAL FOREST
STATE OF NEVADA
STATE OF NV DIVISION OF FORESTRY

Haiwee Geothermal Leasing Area
Elected Officials Contact List

EL CENTRO CITY COUNCIL
STATE ASSEMBLY DISTRICT 34
STATE ASSEMBLY DISTRICT 41
STATE ASSEMBLY DISTRICT 65
STATE ASSEMBLY DISTRICT 70
STATE ASSEMBLY DISTRICT 79
STATE SENATE DISTRICT 25
STATE SENATE DISTRICT 33
STATE SENATE DISTRICT 36
STATE SENATE DISTRICT 38
STATE SENATE DISTRICT 39
US CONGRESS 22ND DISTRICT
US HOUSE OF REPRESENTATIVES DIST 20
US HOUSE OF REPRESENTATIVES DIST 26
US HOUSE OF REPRESENTATIVES DIST 34
US HOUSE OF REPRESENTATIVES DIST 38
US HOUSE OF REPRESENTATIVES DIST 41
US HOUSE OF REPRESENTATIVES DIST 43
US HOUSE OF REPRESENTATIVES DIST 45
US HOUSE OF REPRESENTATIVES DIST 51
US SENATE
COUNCILMEMBER
IMPERIAL CO BOARD OF SUPERVISORS
KERN CO BOARD OF SUPERVISORS
LA JOLLA TOWN COUNCIL
ORANGE CO BOARD OF SUPERVISORS
RIVERSIDE CO BOARD OF SUPERVISORS
SAN BERNARDINO CO BOARD OF SUPERVISORS
SAN DIEGO CO BOARD OF SUPERVISORS
TULARE CO BOARD OF SUPERVISORS

Haiwee Geothermal Leasing Area
City Contact List

CITY MANAGER
CITY MANAGERS ASSOCIATION
CITY MUNICIPAL MUSEUM
CITY OF AGOURA HILLS
CITY OF ALHAMBRA
CITY OF ANAHEIM
CITY OF ARCADIA
CITY OF ARTESIA
CITY OF AZUSA
CITY OF BALDWIN PARK
CITY OF BANNING
CITY OF BARSTOW
CITY OF BARSTOW PLANNING DEPT
CITY OF BEAUMONT
CITY OF BELL
CITY OF BELL GARDENS
CITY OF BELLFLOWER
CITY OF BEVERLY HILLS
CITY OF BIG BEAR LAKE
CITY OF BISHOP
CITY OF BLYTHE
CITY OF BRADBURY
CITY OF BREA
CITY OF BUENA PARK
CITY OF BURBANK
CITY OF CALEXICO
CITY OF CALIPATRIA
CITY OF CARSON
CITY OF CERRITOS
CITY OF COALINGA
CITY OF CORONADO
CITY OF COSTA MESA
CITY OF CUDAHY
CITY OF CULVER CITY
CITY OF CYPRESS
CITY OF DEL MAR
CITY OF DESERT HOT SPRINGS
CITY OF DOWNEY
CITY OF DUARTE
CITY OF EL CENTRO
CITY OF EL SEGUNDO
CITY OF FARMERSVILLE
CITY OF FONTANA
CITY OF FOUNTAIN VALLEY
CITY OF FULLERTON
CITY OF GARDENA
CITY OF GRAND TERRACE
CITY OF HAWAIIAN GARDENS
CITY OF HAWTHORNE
CITY OF HEMET
CITY OF HERMOSA BEACH
CITY OF HIDDEN HILLS
CITY OF HOLTVILLE
CITY OF HUNTINGTON BEACH
CITY OF HUNTINGTON PARK
CITY OF IMPERIAL
CITY OF IMPERIAL BEACH
CITY OF INDIO
CITY OF INGLEWOOD
CITY OF IRVINE
CITY OF IRWINDALE
CITY OF LA CANADAFLINTRIDGE
CITY OF LA HABRA
CITY OF LA MIRADA
CITY OF LA PALMA
CITY OF LA QUINTA
CITY OF LAGUNA BEACH
CITY OF LAKE ELSINORE
CITY OF LAKEWOOD
CITY OF LAWNDALE
CITY OF LEMON GROVE
CITY OF LOMITA
CITY OF LOS ALAMITOS
CITY OF LYNWOOD
CITY OF MANHATTAN BEACH
CITY OF MAYWOOD
CITY OF MONTEBELLO
CITY OF MORENO VALLEY
CITY OF NATIONAL CITY
CITY OF NEEDLES
CITY OF NEWPORT BEACH
CITY OF NORCO
CITY OF ORANGE
CITY OF PAHRUMP
CITY OF PALM DESERT
CITY OF PALM SPRINGS

CITY OF PALOS VERDES ESTATES
CITY OF PARAMOUNT
CITY OF PERRIS
CITY OF PICO RIVERA
CITY OF PLACENTIA
CITY OF POMONA
CITY OF POWAY
CITY OF RANCHO MIRAGE
CITY OF RANCHO PALOS VERDES
CITY OF REDLANDS
CITY OF REDONDO BEACH
CITY OF RIVERSIDE
CITY OF ROLLING HILLS
CITY OF ROLLING HILLS ESTATES
CITY OF ROSEMEAD
CITY OF SAN BERNARDINO
CITY OF SAN CLEMENTE
CITY OF SAN DIEGO
CITY OF SAN DIMAS
CITY OF SAN GABRIEL
CITY OF SAN JACINTO
CITY OF SAN JUAN CAPISTRANO
CITY OF SAN MARCOS
CITY OF SAN MARINO
CITY OF SANTA ANA
CITY OF SANTA FE SPRINGS
CITY OF SANTA MONICA
CITY OF SEAL BEACH
CITY OF SIERRA MADRE
CITY OF SIGNAL HILL
CITY OF SOUTH GATE
CITY OF SOUTH PASADENA
CITY OF STANTON
CITY OF TEMPLE CITY
CITY OF TORRANCE
CITY OF TULARE
CITY OF TUSTIN
CITY OF TWENTYNINE PALMS
CITY OF UPLAND
CITY OF VICTORVILLE
CITY OF VILLA PARK
CITY OF VISTA
CITY OF WALNUT
CITY OF WEST COVINA
CITY OF WHITTIER
CITY OF YORBA LINDA
LANCASTER CITY HALL
VICTORVILLE CITY HALL
CITY OF RAMONA PUBLIC LIBRARY
TOWN OF APPLE VALLEY
TOWN OF YUCCA VALLEY

Haiwee Geothermal Leasing Area
Native American Tribes Contact List

CHEMEHUEVI TRIBE
FORT MOJAVE INDIAN TRIBE
FT MOJAVE INDIAN TRIBE
TRIBAL COUNCIL CHAIR, BIG PINE PAIUTE TRIBE OF THE OWENS VALLEY
TRIBAL COUNCIL CHAIR, BISHOP PAIUTE TRIBE
TRIBAL COUNCIL CHAIR, FORT INDEPENDENCE PAIUTE TRIBE
TRIBAL COUNCIL CHAIR, LONE PINE PAIUTE-SHOSHONE TRIBE
TRIBAL COUNCIL CHAIR, TIMBISHA SHOSHONE TRIBE
AGUA CALIENTE BAND OF CAHUILLA INDIANS
AUGUSTINE BAND OF MISSION INDIANS
BUREAU OF INDIAN AFFAIRS
CABAZON BAND OF MISSION INDIANS
CAMPO BAND OF MISSION INDIANS
CUYAPAIPE BAND OF MISSION INDIANS
JAMUL INDIAN VILLAGE
LAS VEGAS INDIAN CENTER
MANZANITA BAND OF MISSION INDIANS
MESA GRANDE BAND OF MISSION INDIANS
PAUMA BAND OF MISSION INDIANS
PECHANGE BAND OF MISSION INDIANS
SAN LUISENO BAND OF MISSION INDIANS
SAN MANUEL BAND OF MISSION INDIANS
SAN PASQUAL BAND OF DIEGUENO INDIANS
SANTA YSABEL BAND OF MISSION INDIANS
SOBABA BAND OF MISSION INDIAN
SYCUAN BAND OF MISSION INDIANS
TIMBISHA BAND SHOSHONE INDIANS
TORRESMARTINEZ BAND OF MISSION INDIANS
TORRES-MARTINEZ DESERT CAHUILLA INDIANS
TRIBAL COUNCIL CHAIR, KERN VALLEY INDIAN COUNCIL
TRIBAL COUNIL CHAIR, TUBATULABALS OF KERN VALLEY

Haiwee Geothermal Leasing Area
Organizations Contact List

A&L LITHO, INC
A.G. EDWARDS & SONS, INC.
A1 AGGREGATES INC
AGRI EMPIRE COMPANY
AMA DISTRICT 37
AMERICAN HIKING SOCIETY
APPLE VALLEY GUN CLUB
APPLE VALLEY GUN CLUB INC
AUDUBON SOCIETY
AUDUBON SOCIETY KERN
AUDUBON SOCIETY NATIONAL
AUDUBON SOCIETY RIVERSIDE CHAPTER
AUDUBON SOCIETY SOUTH COAST CHAPTER
BAKERSFIELD SANDSTONE BRICK COMPANY
BIGHORN GOLF CLUB
BORN DIRTY INDUSTRIES
BRUBAKER MANN INC
CA TORTOISE TURTLE CLUB
CA TURTLE AND TORTOISE CLUB
CA TURTLE TORTOISE CLUB MEMBER
CAL ENERGY COMPANY INC
CALIF TURTLE AND TORTOISE CLUB
CALIF TURTLE TORTOISE CLUB
CALIFORNIA 4 WHEEL DRIVE CLUB
CALIFORNIA NATIVE PLANT SOCIETY
CALIFORNIA NATIVE PLANT SOCIETY EL CAJON CHAPTE
CALIFORNIA NATIVE PLANT SOCIETY PACIFIC PALISADE
CALIFORNIA NATIVE PLANT SOCIETY SAN DIEGO CHAPTER
CALIFORNIA TURTLE AND TORTOISE CLUB
COLE GROUP, INC.
COMM ENT INC
CPISTRANO VALLEY ROCK AND MINERAL CLUB
CRESTLINE 4WD CLUB
DEATH VALLEY 49ERS INC
DEL AIR ROCKHOUND CLUB
DELVERS GEM AND MINERAL SOCIETY
DESERT IRONWOODS RESORT, INC
DESERT MOTORCYCLE CLUB
DESERT WILDLIFE UNLIMITED INC
DESOMOUNT CAMPING CLUB
DOWELL SCHLUMBERGER INC
DOWNSTREAM SERVICES, INC
DRIFTERS JEEP CLUB
DWE ENGINEERING INC
EARTHWATCH CLUB
EXECUTIVESUITE SERVICS INC
FEATHERROCK INCUS PUMICE
FILM PERMITS UNLIMITED INC
FIRST ALLIED SECURITIES INC
FLY BY NIGHT 4X4 CLUB
GEAR GRINDERS 4 WD CLUB
GEM AND MINERAL SOCIETY TULE
GLENN RECORD INC
HAPPINESS IS BUGGY CLUB
HEMET HS CONSERVATION CLUB
HEMET JEEP CLUB
HOOVED ANIMAL HUMANE SOCIETY
HUMBOLDT BUGGY ATV ASSN INC
I AND M SHEEP COMPANY
IMPERIAL VALLEY GEM AND MINERAL SOCIETY
INDUSTRIAL METALS SALVAGE
INFORMATION BOULEVARD INTERNET SERVICES, INC
ISLANDERS GEM AND MINERAL SOCIETY
IZAAK WALTON LEAGUE OF AMERICA INC
JEEPING JEEPERS JEEP CLUB
KERN CO HISTORICAL SOCIETY
KERN CO MINERAL SOCIETY
KERN CO MINERALOGICAL SOCIETY
KERNCREST AUDUBON SOCIETY
LAKESIDE SPORTSMEN CLUB
LAND DEPT SHELL CALIFORNIA PROD INC
LAND PARCEL LIQUIDATORS INC
LAS VEGAS VALLEY BICYCLE CLUB
LOCKHEAD RECREATION CLUB
LONE TREE CATTLE COMPANY
LONG BEACH GEM MIN SOCIETY
LUNAR LAND YACHT CLUB
MATLOW KENNEDY COMPANY
MERKEL & ASSOCIATES, INC
MICROTEK LAB INC
MOBIL EXPLORATION AND PRODUCING US INC
MONO-INYO SHEEP COMPANY

MOTORCYCLE INDUSTRY COUNCIL
NADEAU TRAIL, INC
NATIVE PLANT SOCIETY
NATURAL HISTORY CLUB
NEEDLES GEM MINERAL CLUB
OF WOMENS CLUBS
OMYA CALIFORNIA INC
ORANGE COUNTY 49ERS INC
ORCUTT MINERAL SOCIETY
PACIFIC SHORES CONSTRUCTION AND PAINTING, INC
PACIFIC TELEPHONE COMPANY
PALOMAR GEM AND MINERAL CLUB
PALOMAR SPORTSMENS CLUB
PARKER INDUSTRIAL PROPERTIES
PFUESSSTAUFER CA INC
PLUESSSTAUFER INC
PRO CIRCUIT AV, INC
PUBLIC LANDS FOR THE PEOPLE INC
RABBIT CHASERS BUGGY CLUB
RED ROCK AUDUBON SOCIETY
REDEV INC
RHEOX INC
RIVER RUNNERS INC
ROCKCRAFTERS CLUB
ROYAL GOLD INC
SAFARI CLUB INTERNATIONAL
SAN DIEGO COUNTY GEM AND MINERAL SOCIETY
SAN DIEGO LAPIDARY SOCIETY
SAREEA AL JAMEL 4WD CLUB
SEARCHERS GEM AND MINERAL SOCIETY INC
SEARCHERS GEM MIN SOCIETY
SEQUOIA SIDEWINDERS 4WD CLUB
SIERRA CLUB
SIERRA CLUB CHAPTER CONSERVATION CHAIRMAN
SIERRA CLUB FRIENDS OF MOJAVE ROAD
SIERRA CLUB KERN KAWEAH CHPT
SIERRA CLUB MOJAVE GROUP
SO COUNCIL CONSERVATION CLUBS
SOCIETY FOR THE CONSERVATION OF BIGHORN SHEEP
SOCIETY OF CA ARCHAEOLOGY DEPT OF ANTHRO
SOLE TECHNOLOGY INC
SOUTHERN CLAYEDWARD LOWE INC
SPECIALTIES MINERALS INC
SPINNIN FOURS 4WD CLUB
STIMULUS INC
SUPERIOR MORTGAGE INC
TAFT SPORTSMAN CLUB
TAFT SPORTSMEN CLUB
TAFT SPORTSMENS CLUB
TETRA TECH INC
THE DESERT PROTECTIVE COUNCIL, INC
THE WATLING COMPANY
THE WILDERNESS SOCIETY
THOMAS OLSEN ASSOCIATES INC
TIERRA DEL SOL FOUR WHEEL DRIVE CLUB
TRAILMASTERS 4WD CLUB
TRI-CITIES LAPIDARY SOCIETY
TULE GEM & MINNERAL SOCIETY
US GYPSUM COMPANY
VERBAL SKILL INC
VICTOR VALLEY GEM MIN CLUB
WAX RESEARCH, INC
WESTERN MINNING COUNCIL INC
WJM FARMING INC
WOMENS CLUB OF BELLFLOWER
AGRI-EMPIRE CORP
AMA DIST 37
BACK COUNTRY HORSEMEN OF CA
BARSTOW BOARD OF REALTORS
CA OFF ROAD VEHICLE ASSN
CALIF OFFROAD VEHICLE ASSN
CALIFORNIA FILM COMMISSION
CALIFORNIA MINING ASSOCIATION
CALIFORNIA OFF HWY VEHICLE ASSOCIATION
CALIFORNIA OFF ROAD VEHICLE ASSOC
CANYON RESOURCES CORP
CANYON RESOURCES CORPORATION
CASCADIA EXPLORATION CORP
CV ORGANIC FERTILIZERS
DESERT CONSERVATION INSTITUTE
DOORA LAND CORP
ECOLOGY MANAGEMENT CORP
EL MIRAGE MAC STEERING COMM OFF ROAD

PARK
ENV MANAGEMENT ASSOCIATES
FOUR J CATTLE CORP
FREMONT GIRL SCOUT COUNCIL
FRIENDS OF THE MOJAVE ROAD
GIRL SCOUTS JOSHUA TREE COUNCIL
GOLD DOME MINING CORP
IMPERIAL VALLEY ASSOCIATION OF GOVERNMENTS
INLAND FISH GAME ASSOCIATIO
INTERNATIONAL MOUNTAIN BICYCLING ASSOC
CENTRAL ORANGE COUNTY CHAP LEAGUE OF WOMEN VOTERS
LANDERS ASSOCIATION
LILBURN CORP
LOWE RESERVE CORP
MANAGEMENT AND TRAINING CORP
MINE RECLAMATION CORP
MONACHE ASSOCIATES
MOTION PICTURE ASSOCIATION OF AMERICA
NATIONAL OHV CONSERVATION COUNCIL
NATURAL RESOURCES CONSERVATION SERVICE
NEEDLES DESERT WILDLIFE ASSOC
NEWMONT MINING CORP
NONPROFIT COUNSEL
OFF ROAD BUSINESS ASSOCIATION
OHV COMMISSION
LEAGUE OF WOMEN VOTERS SAN DIEGO COUNTY
NORTH ORANGE COUNTY CHAP LEAGUE OF WOMEN VOTERS
ORGANIZATION AGAINST TOXIC EXPOSURE
PACIFIC MINING ASSOCIATION
ORANGE COUNTY 3 WHEELERS
ORANGE COUNTY 49ERS
ORANGE COUNTY BUGS
ROAD RUNNER SPORTS
ORANGE COUNTY FILM OFFICE
SAN DIEGO ASSOCIATION OF GOVERNMENTS
SAN DIEGO FILM COMMISSION
SAN DIEGO OFF ROAD COALITION
SAN DIEGO OFF ROAD MAGAZINE
SAN DIEGO OFFROAD COALITION
SAN DIEGO OFF-ROAD COALITION
SAN GORGONIO CHAPTER
SAN GORGONIO GEM AND MINERALS
SANDPAPER
SERRANO BOARD OF REALTORS
SO CA ROCK PRODUCTS ASSOC
SO CALIF BIRD DOG ASSOC
SOUTHEAST COUNSELING CONSULTING SVCS
SOUTHERN CALIFORNIA EDISON LICENSING AND PLANNING
SOUTHERN CALIFORNIA SOARING ASSOCIATION
STAFFER & FLINT ACCOUNTANCY CORP
SYLMAR HANG GLIDING ASSOC
SYLMAR HANG GLIDING ASSOCIATION
THE DESERT TORTOISE COUNCIL
THE EARTH TECHNOLOGY CORP
UNITED CONTINENTAL DEVELOPMENT CORP
UNITED FOUR WHEEL DRIVE ASSOCIATIONS
US HANG GLIDING ASSOC
VICEROY GOLD CORP
VICEROY GOLD CORPORATION
WESTERN MINING COUNCIL
YUCCA VLY BOARD OF REALTORS
4H OIL CO
A & F SHEEP CO
ALL FOURS OF SOCAL
AMERICAN MUSTANG BURRO ASSN
ASSN COLORADO RIVER WATERWAY
AUTOMOTIVE PUBLIC RELATIONS
BERNAL SHEEP CO
CAL FED MINERALOGICAL SOC
CAL FED MINERALOGICAL SOCIETIES
CALIFORNIA ASSN 4X4
CALIFORNIA FEDERATION OF MINERALOGICAL SOCIETIES
CHEVRON USA PRODUCTION CO
COACHELLA VALLEY CYCLING ASSN
DEL NORTE GEM MINERAL SOC
DESERT TRAIL ASSN OF CALIF
EL CAJON VALLEY GEM MIN SOC
EL TEJON SHEEP CO
ENTOMOLOGICAL SOC
EXCELMINERAL CO
FRUIT GROWERS SUPPLY CO

GALAINENA SHEEP CO
GRANITE CONSTRUCTION CO
HALL MINING CO
HARRIS FEEDING CO
HUG CONSTRUCTION CO
INTERNATIONAL SCOUT ASSN
LA RONNA JOSOBA CO
MINERALOGICAL SOC OF SOCAL
MISSION ENERGY CO
MONO SHEEP CO
MORONGO BASIN CONSERV ASSN
NATIONAL SPELEOLOGICAL SOC
NEIGHBORHOOD HOUSE ASSN
O BAR O CATTLE CO
ORANGE BELT MINERALOGICAL SOC
PACIFIC COAST ARCH SOC
PACIFIC MUTUAL LIFE INSURANCE CO
PUBLIC LANDS FOR THE PEOPLE
RAYMOND CO
RICK ENGINEERING CO
RIVERSIDE CEMENT CO
RIVERSIDE CO
S CALIF EDISON CO
SAN BERNARDINO CO
SAN DIEGO ARCHEOLOGICAL SOC
SO CALIFORNIA EDISON CO
SOUTHERN CA EDISON CO
SOUTHERN CALIFORNIA EDISON CO
SOUTHERN CALIFORNIA GAS CO
SOUTHWEST PORTLAND CEMENT CO
SOUTHWESTERN CEMENT CO
TURN KEY ENGINE SUPPLY
UNIGRAFIX
US BORAX
US GYPSUM COMPAY
US POOR WHEELERS
USBR YUMA AREA OFFICE
VALLEY GEM MINERAL
VANCE ELECTRIC
VICTOR VALLEY 4 WHEELERS
VICTOR VALLEY GEM MIN
VICTOR VALLEY MUSEUM ASSN
VICTORY OIL CO
VIEJAS GROUP OF CAPITAN GRANDE BAND OF MISSION IND
VOLUNTEERS 4 DESERT RACING
W LOS ANGELES JACL
WANDA GREEN TRUST
WATROUS S CYCLING ENTERPRISES
WEBBER AND WEBBER
WESTERN FOUNDATION OF VERTEBRATE ZOOLOGY
WESTERN OUTDOORS
WESTERN ROCKHOUNDS ASSN
WESTERN STATES PETROLEUM ASSN
WESTERN STATES PETROLEUM ASSO
WEYMOUTH SCIENCE CENTER
WHITEWATER ROCK CO
WHITEWATER ROCK SUPPLY CO
WHOA
WIGGINTON RANCH
WILD SPACES
WILDERNESS ASSN OF SAN DIEGO
WILLIAMTERRY BEENE
WINDSKATE
WOOD
YAMAHA OF SAN LUIS OBISPO
YUCAIPA VALLEY GEM MIN SOC
1STANDARD
4WD GHOST RIDERS
4X4 FREELANDERS
ACE REALTY
AERA ENERGY LLC
AFTERSHOCKS
ALEXANDER HEFLIN RANCH
ALL AMER AGGREGAT
AMA D37
AMERICAN HANDGUNNER
AMERICAN INSTITUTE OF PROFESSIONAL GEOLOGISTS
AMERICAN TOURS INTERNATIONAL
ANGELES NATIONAL FOREST
ANTHONY C SYCIP
AQUAFARMS
ASA AXECUTIVE COMMITTEE
ASARO BUILDERS

Haiwee Geothermal Leasing Area
Organizations Contact List

ASUNCION CONTRERAS
ATC FEVER
ATV CONNECTION
B D TRUST
BANNER QUEEN RANCH
BEACH N TOYS
BEACON
BEVERLY HALL
BEVERLY WILSHIRE HOTEL
BIDART BROTHERS
BIGHORN INSTITUTE
BIRDWELL RANCH
BLAST OFF HYDRO BLAST OFF ENTERPRISES
BLUERIBBON COALITION
BOB LONGPRE PONTIAC
BOBS CREEK RANCH
BOY SCOUTS
BOY SCOUTS OF AMERICA
BOYD DEEP CANYON RESEARCH CEN
BUENA VISTA CHAPTER
C/O KEITH RELPH
CA PORTLAND CEMENT
CALIF GROUND POUNDERS
CALIFORNIA GROUND POUNDERS
CALIFORNIA WILDERNESS COALITION
CALNEV PIPELINE
CALVARY BAPTIST CHURCH
CAMP ED
CAMPING BARES
CAPITAN GRANDE BND MISSION IN
CATTANI AND SON
CATTLEMEN ATLARGE COMMITTEE
CATVA
CENTERPOINTE LENDING
CENTRAL VALLEY SPORTSMEN
CENTURY 21 FAIRWAY
CENTURY HOMES COMMUNITIES
CFMS
CHARTER OAK REAL ESTATE
CHAVARIN WELDING
CHEVRON
CIBOLA WILDLIFE REFUGE
CIRCLE MTN CONSULTANTS
CLAUDIA LAKOSSIN
CO-CHAIR, NUUI CUNNI INTERPRETATIVE CENTER
COCHELLA VALLEY MOUNTAINS CONSEVANCY
COINSHOOTERS CLIQUE
COLORADO RIVER REC PROJECT
CONVAIR ROCKHOUNDS
CORTE MADERA RANCH
CORVA
CUSHENBURY MINE TRUST
DANICE SIMON JT
DEATH VALLEY 49ERS
DEL AIR ROCKHOUNDS
DERT
DESERT DISPATCH
DESERT DIVERS
DESERT ENTERPRISES
DESERT FOXES
DESERT RACE SUPPORT
DESERT TORTOISE PRESERVE COM
DESERT TORTOISE PRESERVE COMM
DESERT WILDLIFE UNLIMITED
DOMESTIC TECHNOLOGY INTNL
DON EMDE PRODUCTIONS
DUNE BUGGIES & HOT VWS
DVM
EAGLERIDER GLENDALE
EARLY BRONCOS LIMITED
EARTH JUSTICE ENVIRONMENTAL LAW CLINIC
EARTH SYSTEMS
EASTSIDE FEDERAL COMPLEX
EASY RIDERS
ECOLOGICAL 4 WHEELING ADVENTURES
EDITH WILLOUGHBY
EDITORROCKHOUNDS BULLETIN
EL CHICANO
EL SOL DE SAN DIEGO
ELITE AUTO SERVICES
ELLEN VAN CEERENT
EPWATRANSPORTATION
EQUESTRIAN TRAILS
ERWIN ENTERPRISES
ESMERELDA TRUCKHAVEN GEOTHERMAL LLC
EW MERRITT FARMS

F K CHAN
FORT MOJAVE RESERVATION
FOUR WHEELIN DEALIN 4WDC
FRATERNITY OF THE DESERT BIGHORN
FRIENDS CALICO EARLY MAN SITE
FRIENDS OF DESERT WETLAND PARK
FRIENDS OF EL GARCIS
FRIENDS OF EL MIRAGE
FRIENDS OF THE DUNES
GANONG O AND G OPERATIONS
GEOLOGICAL SCIENCES DPET
GEOTHERMAL RESOURCES
GERMAN STREET
GFOUR CONSTRUCTION
GIFFORD ENGINEERING
GOLD ROCK RANCH
GOLD STANDARD LODE MINE
GRANTS AIRPORT
GRUBB & ELLIS
H B RANCH
H. ELIZABETH WILMARTH
HARVEY HOUSE SHELL
HAY BROTHERS SHEEP
HEADFRAME
HELT ENGINEERING
HIGH DESERT ENV DEFENSE FUND
HISPANOS UNIDOS
HOLROYD TILE AND STONE
HONDA RESEARCH AND DEVELOPMENT ATTN LRI DI
HORSE ILLUSTRATED
HOUSE OF METAMORPHOSIS
HUMAN RELATIONS ASSIST
IMAM MINISTER
IMMIGRATION AND NATURALIZATION
IMMIGRATION NATURALIZATION
IMPERIAL PRINTERS
IMPERIAL VALLEY SIDEWINDERS
INLAND EMPIRE CHAPTER
IRONWOOD CHRISTIAN ACADEMY
IZQUIERDO WOOL GROWERS
JEFFREY STONE
JET PROPULSION LABORATORIES
JOEHAULER MOTORCYCLES CARRIERS
JOHNSON BROTHERS RANCH
JOSHUA TREE C C
JOUGHIN RANCH
KAISER STEEL RESOURCES
KEMP RANCH
KERN COG
KERN RIVER MUSKRATS
KERNVILLE CHAMBER OF COMERCE
KILPATRICK ENERGY GROUP
KINGSBURG 4WDC
LAFCO-SAN BERNARDINO
LAKE MINERALS
LAND PARCEL LIQUIDATORS
LAND ROVERS OF FONTANA
LARRALDE SHEEP
LAS TORTUGAS
LAURA RODRIGUEZ
LAW OFFICES
LAW OFFICES OF PAUL ZOGG
LEAGUE OF WOMAN VOTERS
LEAGUE OF WOMEN VOTERS
LEAGUE OF WOMEN VOTERS OF BH
LEEFAA INVESTMENTS
LIONEL SAWYER & COLLINS
LORI DODGE
LOS ADVENTUREROS
LOS ARRIEROS 4WDC
LOS COYOTES RESERVATION
LOS PAISANOS 4WDC
LOS TROQUEROS 4X4
MANZANITA RANCH
MEFFORD
MEROE ARTIST GROUP LLC.
MINERAL KING PACK STATION
MINERALS
MINNEOLA MINI MART
MOJAVE RIVER VALLEY MUSEUM
MOJAVE RIVER VALLEY MUSUEM
MONROVIA CANYON PARK
MORE
MOSO RAC
MOTORCYCLE SAFETY FD

MOUNTAIN DEFENSE LEAGUE
MT SAN JACINTO HS
NAACP DELANO
NATIONAL OUTDOOR COALITION
NATL SORTY OF PHI DELTA KAPPA
NATURAL HISTORY MUSEUM
NATURE BOY AND BEARCAT
NAVY LEAGUE
NEON DIVERS
NICKEL FAMILY LLC
NRA
OAK CANYON NATURE PARK ANAHEIM PRKS
OC 49S
OCOTILLO WELLS SVRA
OREG LTD REAL ESTATE LOAN FUND
ORMAT NEVADA
OWENS VALLEY CAREER DEVELOPMENT CENTER
P V ENTERPRISES
PACBELL
PACIFIC BELL
PACIFIC SOUTHWEST BIOSERVICES
PACIFIC SW BIOLOGICAL SERVICES
PACIFIC SW RESEARCH STATION
PAISANO PUBLISHING
PALOMAR COMMUNICATIONS
PALOS VERDES PEN CHAPTER
PATRIOT RESOURCES LLC
PAUL T SELZER ESQ ATTORNEY AT LAW
PEGMATITE
PENDLETON COAST STATE PARK
PERRIS VALLEY FOUR WHEELERS
PETROLIC SERVICES
PG AND E
PGE
PIPARIAN REPAIRS
PLUM PRODUCTIONS
PO BOX 584
POINTS WEST REALTY
POMONA VALLEY TRAILMASTERS
PORTA POTTY PILOTS
PRESERVATION OF BIGHORN
PRO ARMOR
PROFESSOR
PRUDENTIAL CALIFORNIA REALTY
QUAIL UNLIMITED
QUARTERCIRCLE A 1 RANCH
RAC MEMBER
RANCHO MISSION VIEJO
RANCHO MUSCUPIABE
REAL ESTATE LOAN FUND OREG LTD
REGIONAL BRANCH
REGROUPERS 4WDC
RESOURCE CENTER CA STATE POLY
RESOURCE CENTER CAL STATE POLY
RIVERLAND RESORT
RIVERMERE AA RANCHES
RIVERSIDE BLACK VOICE
RIVERSIDE RUFF RIDERS
ROBERT BIRD
ROCKATOMICS GEM MINERALS SO
ROSSI LAND AND CATTLE
S CALIF EDISON
SAN BERNARDINO AMERICAN
SAN BERNARDINO CO MUSEUM
SAN BERNARDINO NATIONAL HISTORY MUSEUM
SAN DIEGO 4 WHEELERS
SAN DIEGO CHAPTER
SAN DIEGO NATURAL HISTORY MUSEUM
SAN DIEGO OUTBACK 4WDC
SAN DIEGO OUTBACKS 4X4
SAN DIEGO SPORTS CYCLES
SAN DIEGO TRAIL RIDERS
SAN DIEGO VOICE VIEWPOINT
SAN DIEGUITO RIDERS
SAN FERNANDO VALLEY CHAPTER
SAND JEEPS
SANTA CLARITA VALLEY CHAMBER
SANTA FE PACIFIC GOLD MESQUITE MINE
SANTA MONICA COLLEGE LRC
SANTIAGO RANCH
SCHINDLER BROTHERS
SEISMOLOGICAL LAB 25221
SENATOR BARBARA BOXER STAFF
SERVICE
SFV PARTTIME 4 WHEELERS
SILICZ ESTATE

SJM BIOLOGICAL CONSULTANTS
SLASH X COMMUNITY
SLASH X COMMUNITY REP
SMALL MINERS OF AMERICA
SMITH RANCH
SO NV WATERFOWLERS
SOLID WASTE DIV CO OF SAN DIEGO
SONY BONO NATL WILDLIFE REUGE
SORRELS & KEEFER
SOUTH BAY 4X4S
SOUTHERN CALIFORNIA ATV
SOUTHERN CALIFORNIA EDISON
SOUTHERN CALIFORNIA EDISON COM
SOUTHERN CALIFORNIA EDISON FEDERAL PERMITS
SOUTHWEST GAS TRAIL HIKERS
SOUTHWEST MIN ENG
SOUTHWEST PROSPECTOR AND MINERS
SOUTHWEST PROSPECTOR ASST
SOUTHWESTERN CABLE
SOUTHWESTERN CEMENT
SOUTHWESTERN HERPETOLOGISTS
SOUTHWESTERN MINERS
STANDARD MINERALS
STAR RANCH
STATE FARM INSURANCE
STONE BUFFALO
STUDIES PROG
SUN AQUA
SUN REPORTER
SYMBIENCE LLC
SYSTEMS ECOLOGY
SYSTEMS SURVEYS
TECHNOLOGY CENTER
THE BRADCO COMPANIES
THE CENTER FOR BIOLOGICAL DIVERSITY
THE DESERT TRAIL
THE GOOD IDEA GROUP
THE LIVING DESERT
THE NATURE CONSERVANCY
THE STANDARD
THOMPSON ENGINEERING
THOROUGHBRED OF CALIFORNIA
TORTOISE GROUP
TRAIL REPAIR IMPROVEMENT
TRANSCOAST FINANCIAL
TRANSPORTATION PROGRAM MANAGEMENT
TREE OF LIFE NURSERY
TU MUNDO

ALHAMBRA CHAMBER OF COMMERCE
ALPINE CHAMBER OF COMMERCE
ANAHEIM CHAMBER OF COMMERCE
ANZA VALLEY CHAMBER OF COMMERCE
AVALON CATALINA ISLAND C OF C
BAKER CHAMBER OF COMMERCE
BAKERSFIELD CHAMBER OF COMMERCE
BANNING CHAMBER OF COMMERCE
BARSTOW AREA CHAMBER OF COMMERCE
BELL CHAMBER OF COMMERCE
BELLFLOWER CHAMBER OF COMMERCE
BEVERLY HILLS CHAMBER OF COMMERCE
BIG BEAR CHAMBER OF COMMERCE
BLYTHE AREA CHAMBER OF COMMERCE
BORREGO SPRINGS CHAMBER OF COMMERCE
BRAWLEY CHAMBER OF COMMERCE
BREA CHAMBER OF COMMERCE
BUENA PARK CHAMBER OF COMMERCE
BURBANK CHAMBER OF COMMERCE
BUTTONWILLOW CHAMBER OF COMMERCE
CALEXICO CHAMBER OF COMMERCE
CALIMESA CHAMBER OF COMMERCE
CANOGA PARK CHAMBER OF COMMERCE
CAPISTRANO BEACH C OF C
CARDIFF BY THE SEA C OF C
CARLSBAD CHAMBER OF COMMERCE
CARSON CHAMBER OF COMMERCE
CATALINA CHAMBER OF COMMERCE
CERRITOS CHAMBER OF COMMERCE
CHAMBER OF COMMERCE
CHERRY VALLEY CHAMBER OF COMMERCE
CHULA VISTA CHAMBER OF COMMERCE
COLTON CHAMBER OF COMMERCE
CONEJO VALLEY CHAMBER OF COMMERCE
COSTA MESA CHAMBER OF COMMERCE
CRESCENTA VALLEY C OF C
CRESTLINE RESORTS C OF C
CUDAHY CHAMBER OF COMMERCE
CULVER CITY C OF C
DAGGETT CHAMBER OF COMMERCE
DANA POINT CHAMBER OF COMMERCE
DELANO DISTRICT C OF C
DOWNEY CHAMBER OF COMMERCE
EL CENTRO CHAMBER OF COMMERCE
EL SEGUNDO C OF C
ENCINO CHAMBER OF COMMERCE
ESCONDIDO CHAMBER OF COMMERCE
FULLERTON CHAMBER OF COMMERCE
GRAND TERRACE CHAMBER OF COMMERCE
GREATER RIVERSIDE CHAMBER OF COMMERCE
GREATER TULARE CHAMBER OF COMMERCE
HEMET CHAMBER OF COMMERCE
HERMOSA BEACH C OF C
HESPERIA CHAMBER OF COMMERCE
HIGHLAND AREA CHAMBER OF COMMERCE
IDYLLWILD CHAMBER OF COMMERCE
IMPERIAL CHAMBER OF COMMERCE
INGLEWOODAIRPORT C OF C
IRWINDALE CHAMBER OF COMMERCE
JOSHUA TREE CHAMBER OF COMMERCE
JULIAN CHAMBER OF COMMERCE
LA HABRA AREA C OF C
LA MESA CHAMBER OF COMMERCE
LAKE ARROWHEAD CHAMBER OF COMMERCE
LAKE ELSINORE VALLEY CHAMBER OF COMMERCE
LAKE ISABELLA CHAMBER OF COMMERCE
LAKESIDE CHAMBER OF COMMERCE
LAKEWOOD GTR CHAMBER OF COMMERCE
LAMONT CHAMBER OF COMMERCE
LINDSAY DISTRICT C OF C
LOMA LINDA CHAMBER OF COMMERCE
LONG BEACH AREA C OF C
LOS ALAMITOS CHAMBER OF COMMERCE
LUCERNE VALLEY CHAMBER OF COMMERCE
MALIBU CHAMBER OF COMMERCE
MANHATTAN BEACH C OF C
MONROVIA CHAMBER OF COMMERCE
MORONGO VALLEY CHAMBER OF COMMERCE
NEEDLES CHAMBER OF COMMERCE
NEWPORT HARBOR C OF C
NILAND CHAMBER OF COMMERCE
NORWALK CHAMBER OF COMMERCE
OCEANSIDE CHAMBER OF COMMERCE
ORANGE CHAMBER OF COMMERCE
PACIFIC PALISADES C OF C
PALOS VERDES PENINSULA C OF C

PARAMOUNT CHAMBER OF COMMERCE
PASADENA CHAMBER OF COMMERCE
PENINSULA CHAMBER OF COMMERCE
PLACENTIA CHAMBER OF COMMERCE
POMONA CHAMBER OF COMMERCE
POPLAR CHAMBER OF COMMERCE
PORTERVILLE GTR C OF C
POWAY CHAMBER OF COMMERCE
RAMONA CHAMBER OF COMMERCE
RANCHO BERNARDO C OF C
RANCHO MIRAGE CHAMBER OF COMMERCE
REDLANDS CHAMBER OF COMMERCE
RIALTO CHAMBER OF COMMERCE
RUNNING SPRINGS AREA C OF C
SAN BERNARDINO AREA C OF C
SAN CLEMENTE C OF C
SAN DIEGO CHAMBER OF COMMERCE
SAN DIMAS CHAMBER OF COMMERCE
SAN MARCOS CHAMBER OF COMMERCE
SAN MARINO CHAMBER OF COMMERCE
SAN PEDRO PENINSULA C OF C
SANTA FE SPRINGS C OF C
SANTEE CHAMBER OF COMMERCE
SOLANA BEACH CHAMBER OF COMMERCE
SOUTH GATE CHAMBER OF COMMERCE
SPRING VALLEY CHAMBER OF COMMERCE
SPRINGVILLE CHAMBER OF COMMERCE
STANTON CHAMBER OF COMMERCE
SUN VALLEY CHAMBER OF COMMERCE
SUN VALLEY AREA CHAMBER OF COMMERCE
SUNLANDTUJUNGA C OF C
TAFT CHAMBER OF COMMERCE
TEMPLE CITY C OF C
THERMAL CHAMBER OF COMMERCE
THOUSAND OAKS/ WESTLAKE VILLAGE REG C OF C
THOUSAND PALMS CHAMBER OF COMMERCE
TOLUCA LAKE CHAMBER OF COMMERCE
TORRANCE AREA CHAMBER OF COMMERCE
TUSTIN CHAMBER OF COMMERCE
VALLEY CENTER CHAMBER OF COMMERCE
VENICE CHAMBER OF COMMERCE
VICTORVILLE CHAMBER OF COMMERCE
VISTA CHAMBER OF COMMERCE
WEST SHORES CHAMBER OF COMMERCE
WESTMINSTER C OF C
WINNETKA CHAMBER OF COMMERCE
WOODLAKE VALLEY C OF C
WOODLAND HILLS C OF C
WRIGHTWOOD CHAMBER OF COMMERCE
YUCAIPA VALLEY CHAMBER OF COMMERCE
YUCCA VALLEY CHAMBER OF COMMERCE
YORBA LINDA C OF C

Haiwee Geothermal Leasing Area
Media Contact List

ANTELOPE VALLEY PRESS
KROP RADIO
ASIAN JOURNAL
CALIFORNIA HORSEMANS NEWS
LAPIDARY JOURNAL
PERSONAL WATERCRAFT ILL CYCLE NEWS
SAN DIEGO WEEKLY NEWS
WESTERN OUTDOOR NEWS
C B S PUBLICATIONS
CYCLE WORLD MAGAZINE
HOT VWS MAGAZINEDUSTY TIMES
INLAND EMPIRE MAGAZINE
PALM SPRINGS LIFE MAGAZINE
SAN DIEGO MAGAZINE
SAND SPORTS MAGAZINE
THREE WHEELING MAGAZINE
WARNER BROS STUDIO PRODUCTION AFFAIRS
WESTERN OUTDOORS PUBLICATIONS
WRIGHT PUBLISHING
BAKERSFIELD CALIFORNIAN
KGAM AM
KGPE TV CBS CH 47
KPBS PBS CH 15
PSBS

Haiwee Geothermal Leasing Area
Schools Contact List

BIOLOGY DEPT CUESTA COLLEGE
CA STATE UNIVERSITY
CA STATE UNIVERSITY CALEXICO
CA STATE UNIVERSITY CARSON
CA STATE UNIVERSITY FULLERTON
CA UNIVERSITY COOPERATIVE EXTENSION
CAL POLY BIOLOGICAL SCIENCES DEPT
CAL POLY LIBRARY DOCUMENTS DEPT
CAL POLY POMONA GEOLOGY DEPT
CAL STATE BAKERSFIELD
CAL STATE POLY ENVIRONMENTAL RESOURCE CENTER
CAL STATE POLYTECHNIC UNIVERSITY
CALIF BAPTIST COLLEGE LIBRARY
CALIFORNIA STATE UNIVERSITY
COALINGA JR COLLEGE
COMPTON COLLEGE
EL CAMINO COLLEGE BIOLOGY DEPT
FULLERTON COLLEGE
LONG BEACH CITY COLLEGE
LOS ANGELES PIERCE COLLEGE
LOS ANGELES VALLEY COLLEGE
LOS ANGELES VALLEY COLLEGE EARTH SCIENCE DEPT
PASADENA CITY COLLEGE
PIERCE COLLEGE
RIVERSIDE COMM COLLEGE DEPT OF GEOGRAPHY
SADDLEBACK COLLEGE SOUTH
SEMITROPIC SCHOOL DISTRICT
APPLE VALLEY JR HIGH SCHOOL
BAKERSFIELD HIGH SCHOOL
BANNING HIGH SCHOOL
CARLSBAD HIGH SCHOOL
DALE JUNIOR HIGH SCHOOL
DANA HILLS HIGH SCHOOL
FOOTHILL HIGH SCHOOL
GARDEN GROVE HIGH SCHOOL
HEMET HIGH SCHOOL
JAMES MONROE HIGH SCHOOL
LA QUINTA HIGH SCHOOL
NORCO JUNIOR HIGH SCHOOL
RUBIDOUX HIGH SCHOOL
SANTANA HIGH SCHOOL
SCHOOL OF BUSINESS AND PUBLIC ADMINISTRATION
CSU SAN BERNARDINO DEPT OF GEOGRAPHY
DEPT OF MATHEMATICS WASHINGTON UNIV
UC RIVERSIDE
UNIV OF CA IRVINE GOV INFO DEPT
UNIV OF CALIF RIVERSIDE
UNIV OF CALIF IRVINE
UNIV OF CALIF RIVERSIDE
UNIV OF CALIF SANTA BARBARA
UNIV OF NEVADA LAS VEGAS
UNIVERSITY OF CA
UNIVERSITY OF CALIF RIVERSIDE
UNIVERSITY OF CALIFORNIA
UNIVERSITY OF CALIFORNIA DEPT OF ARCHEOLOGY
UNIVERSITY OF CALIFORNIA DEPT OF BIOLOGY
UNIVERSITY OF CALIFORNIA IRVINE
UNIVERSITY OF CALIFORNIA RIVERSIDE
UNIVERSITY OF NEVADA LAS VEGAS
UNIVERSITY OF REDLANDS
CALIFORNIA INSTITUTE OF TECHNOLOGY
CSU LIBRARIES
SAN DIEGO STATE UNIV
SAN DIEGO STATE UNIVERSITY

Haiwee Geothermal Leasing Area
Library Contact List

BEAUMONT DISTRICT LIBRARY
COALINGA DISTRICT LIBRARY
PALO VERDE VALLEY DISTRICT LIBRARY
PLACENTIA LIBRARY DISTRICT
SANTA FE SPRINGS CITY LIBRARY
ALHAMBRA PUBLIC LIBRARY
CLARK COUNTY LIBRARY
ANAHEIM PUBLIC LIBRARY
ARCADIA PUBLIC LIBRARY
BEVERLY HILLS PUBLIC LIBRARY
BRAWLEY PUBLIC LIBRARY
IMPERIAL COUNTY FREE LIBRARY
BREWITT BRANCH LIBRARY
BURBANK PUBLIC LIBRARY
CALICO RESEARCH LIBRARY
KERN COUNTY LIBRARY
ORANGE COUNTY PUBLIC LIBRARY
TULARE COUNTY LIBRARY SYSTEM
COACHELLA PUBLIC LIBRARY
COLTON PUBLIC LIBRARY
EL CENTRO PUBLIC LIBRARY
EL SUGUNDO PUBLIC LIBRARY
ELSINORE PUBLIC LIBRARY
ESCONDIDO PUBLIC LIBRARY
FURNACE CREEK PUBLIC LIBRARY
GLENDALE PUBLIC LIBRARY
HEMET PUBLIC LIBRARY
HUNTINGTON BCH PUBLIC LIBRARY
HUNTINGTON BEACH LIBRARY
INGLEWOOD PUBLIC LIBRARY
LAS VEGAS PUBLIC LIBRARY 2
LONG BEACH PUBLIC LIBRARY
MONROVIA PUBLIC LIBRARY
NATIONAL PARK SERVICE LIBRARY
ORANGE PUBLIC LIBRARY
PALM DESERT BRANCH LIBRARY
PALM SPRINGS PUBLIC LIBRARY
REDONDO BEACH PUBLIC LIBRARY
RIVERSIDE CENTRAL LIBRARY
RIVERSIDE PUBLIC LIBRARY
SAN BERNARDINO PUBLIC LIBRARY
SAN MARINO PUBLIC LIBRARY
SIERRA MADRE PUBLIC LIBRARY
SIGNAL HILL PUBLIC LIBRARY
SUNRISE PUBLIC LIBRARY
THE LIBRARY
UNIV OF CA LIBRARY DEPT
YORBA LINDA DIST LIBRARY

Appendix C: Scoping Presentation and Information Boards

Scoping Meeting Presentation

WELCOME

Haiwee Geothermal Leasing Area Scoping Meetings

October 2009

Project Team

- **BLM, NEPA Lead Agency**
  - John Dalton, Project Coordinator
  - Sean Hagerty, Geothermal Lead
  - Linn Gum, Ridgecrest Field Office Assistant Manager

- **POWER Engineers, EIS Preparation**
  - Mike Strand, Project Manager
  - Karen Cadavona, Public Involvement Coordinator

AGENDA

- Introduction
- Project Background and Overview
- Purpose and Need
- Proposed Action
- Alternatives
- NEPA Process/Project Timeline
- Public Comments/Closing Remarks

Geothermal Energy

Geothermal Resources

- 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.
- Resources also can be accessed by wells, and the heat energy can be used for generating electricity.

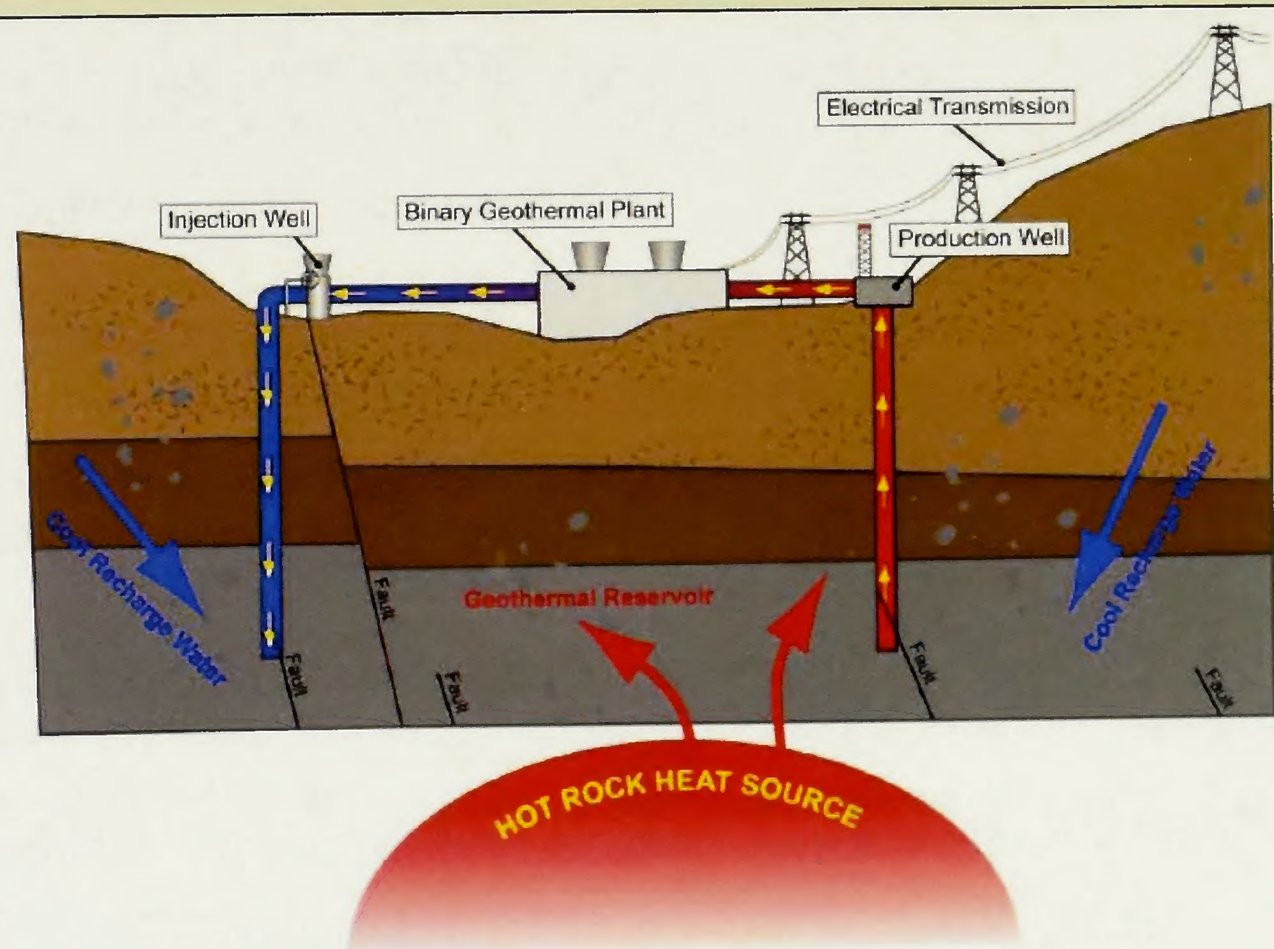
Benefits of Geothermal Energy

- Clean Energy
  - produce only about one-sixth of the carbon dioxide that a relatively clean natural-gas-fuel power plant produces
  - very little if any, of the nitrous oxide or sulfur-bearing gases.
- Reliable Source of Energy
  - available 24 hours a day, 365 days a year
  - geothermal power plants have average availabilities of 90% or higher, compared to about 75% for coal plants
- Geothermal power is accessible locally
  - reducing dependence on foreign oil
- Sustainable renewable resource
  - Earth's core provides an almost unlimited amount of heat
  - Even geothermal areas dependent on reservoir of hot water, the volume taken out can be re-injected.

Geothermal Energy Development

- Exploration
  - Production and Injection Wells
- Development
  - occurs when the operator has located a potentially profitable geothermal reservoir
  - undergo NEPA review by the BLM to evaluate the possible environmental impacts of the action
  - construct access roads, pipelines, power plants, transmission lines & substations
- Utilization
  - Power Plant Operation

Geothermal Energy Process



SOURCE: Geothermal Resources Council and MHA Environmental Consulting 2008

HAIWEE GEOTHERMAL LEASING AREA

Three Types of Above-Ground Geothermal Power Plants:

- **Binary Plants**
  - conventionally applied to comparatively low-temperature (190° - 330° F) hydrothermal resources
  - apply the heat from the resource fluid to heat a separate working fluid which drives a turbine-generator through a closed-loop cycle
- **Flash Plants**
  - applied to higher-temperature (330° F and above) hydrothermal resources
  - "flash" the resource fluid into steam which directly drives a turbine-generator
  - steam is condensed for injection or use in the plant's cooling water circuit
- **Dry Steam Plants**
  - applied in comparatively rare circumstances where the resource emerges from the wells as plant-quality steam
  - the steam is condensed after use and re-injected or used in the cooling water circuit

Leasing of Geothermal Resources on Federal Lands

- considered a major Federal action and a commitment to resource development; therefore, it requires NEPA analysis
- 43 Code of Federal Regulations Part 3200 <u>Geothermal Leasing and Exploration/Utilization</u>
- lease allows the right to future exploration and development of geothermal resources; however, subsequent activities involving surface disturbance will require additional NEPA analysis.

HAIWEE GEOTHERMAL LEASING AREA

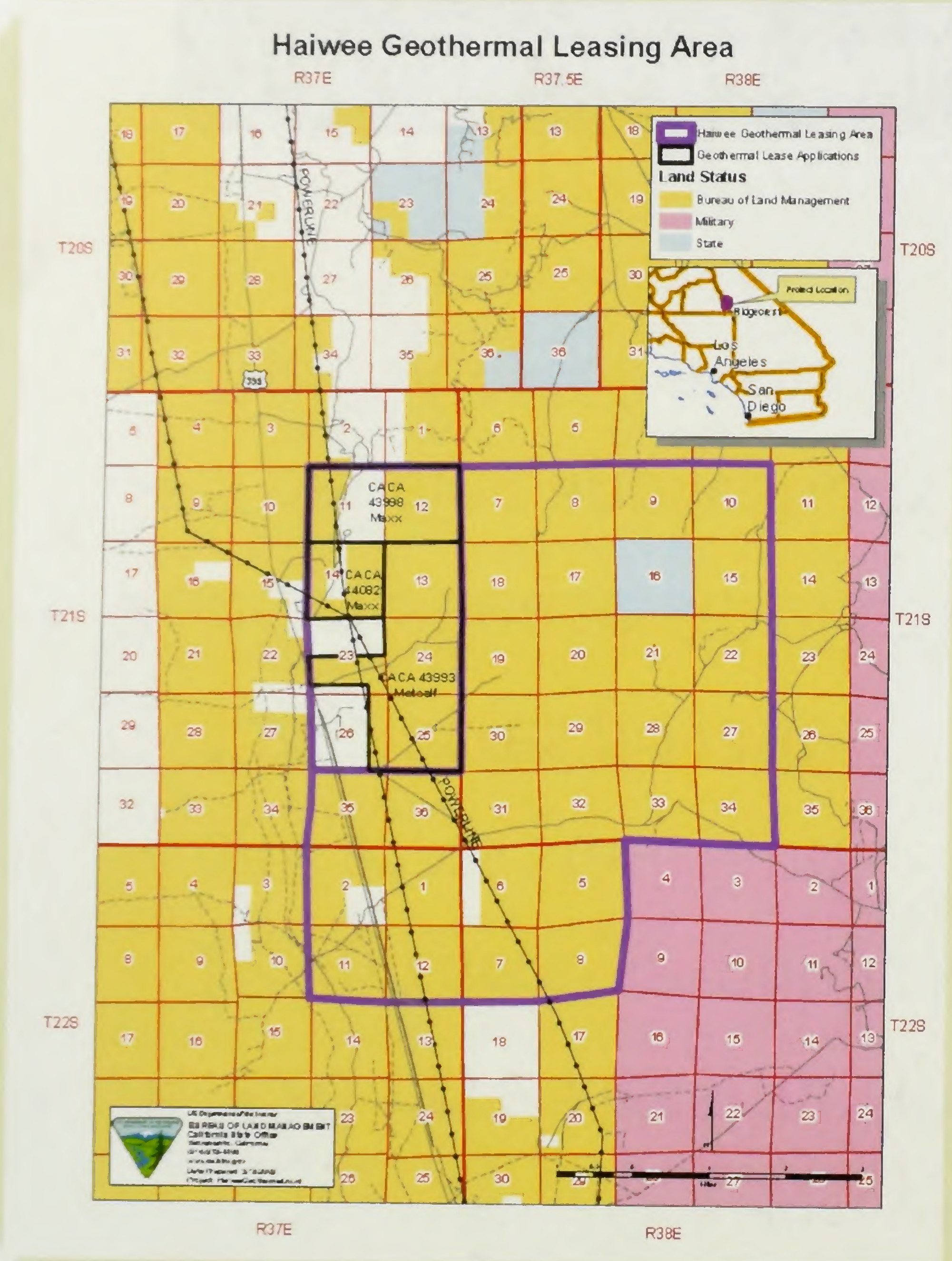
Environmental and Energy Laws

- **National Environmental Policy Act (NEPA) of 1969:** requires Federal agencies to review the effects of its actions on the natural and human-made environment prior to taking action.
- **National Historic Preservation Act of 1966**: provides for the establishment of the National Register of Historic Places to include historic properties such as districts, sites, buildings structures, and objects that are significant in American history, architecture, archaeology, and culture.
- **Endangered Species Act of 1973**: provides for the Federal protection of threatened and endangered plants, insects, fish, and wildlife.
- **The National Energy Policy Act of 2001:** determine ways to reduce the delays in geothermal lease processing as part of the permitting review process.
- **Executive Order 13212 (2001):** expedite Energy-Related Projects, review of permits, or take other actions as necessary to accelerate the completion of such projects.
- **Energy Policy Act of 2005:** encourage the leasing and development of geothermal resources from public lands.
- **Geothermal Steam Act of 1970:** governs the leasing of geothermal steam and related resource on public lands.

California Desert Conservation Area (CDCA) Plan: encompasses 25 million acres of land in Southern California designated by Congress in 1976. The plan provides overall regional guidance for management of public lands in the designated area and establishes long-term goals for protection and use in the California Desert.

Haiwee Geothermal Lease Area

- 24,320 acre Leasing Area includes:
  - 22,460 acres of public lands
  - 640 acres state land
  - 1,220 acres private
- Pending Lease Applications
  - 3 pending applications
  - Total of 4,460 acres



Project Area Map

- Located in Inyo County
- Approximately 13 miles south of Olancha, California
- East of the Inyo National Forest
- West of the China Lake Naval Weapons Center
- South of the South Haiwee Reservoir

HAIWEE GEOTHERMAL LEASING AREA

PURPOSE AND NEED

- Determine whether to approve pending non-competitive geothermal lease applications
- Determine whether to offer competitive leases for geothermal resources in the Leasing Area
- California Desert Conservation Area (CDCA) Plan Amendment
- Implement President's National Energy Policy 2001 and Energy Policy Act of 2005
- Assist the State in meeting the Renewable Portfolio Standard (RPS) goals

PROPOSED ACTION

- Open or close leasing of approximately 22,000 acres of BLM-managed lands in the Haiwee Geothermal Leasing Area
  - Three pending lease applications covering approximately 4,500 acres are also included
  - Does not include State or private lands
- Amend the California Desert Conservation Area (CDCA) Plan of 1980 for leasing of geothermal resources on BLM-managed lands

ALTERNATIVES

- No Action
  - leasing of geothermal lands would stay the same as outlined in the California Desert Conservation Area Plan
- Leasing of less than the proposed 22,000 acres

NEPA Scoping

- Early and open process to determine scope of issues
- Identify significant issues
- Identify range of actions, alternatives, and mitigation measures
- Identify potential significant effects

NEPA Process/Project Timeline

INFORM	Notice of Intent	September 2009
LISTEN	**Scoping**	**October 2009**
EVALUATE	Draft Environmental Impact Statement/ Draft Plan Amendment •Notice of Availability •90-day comment period	Winter 2009
RESPOND	Formal Public Meetings	Spring 2010
	Final Environmental Impact Statement/ Proposed Plan Amendment •Notice of Availability •30-day protest period •60-day Governor's Consistency Review	Fall 2010
DECIDE	Record of Decision	Winter 2010

HAIWEE GEOTHERMAL LEASING AREA

Be a Part of the Process

Submit Comments

BLM welcomes your comments and input throughout the environmental review process. Please write your comments on the comment forms available tonight throughout the room and submit comments one of the following ways:

–Place them in the comment box located at the welcome table.

–Write to:

BLM, California Desert District Office
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
Attn: John Dalton, Haiwee Geothermal Leasing Area Coordinator

–Email comments to cahaiwee@blm.gov

While we encourage the public to submit comments at any time, all comments (letters and emails) for consideration in preparation of the Draft Environmental Impact Statement must be received by close of business **Monday, November 9, 2009.**

Project Updates

Available at www.blm.gov/ca/st/en/fo/ridgecrest.html

Review Project Information and Meet the Team

Please visit the project displays to review the project information. Team members are available to discuss the project and answer questions.

HAIWEE GEOTHERMAL LEASING AREA

THANK YOU!

HAIWEE GEOTHERMAL LEASING AREA

Scoping Meeting Boards

Proposed Action

Amend California Desert Conservation Area Plan to either open or close the 22,000 acre Haiwee Geothermal Lease Area to geothermal exploration, development, and utilization.

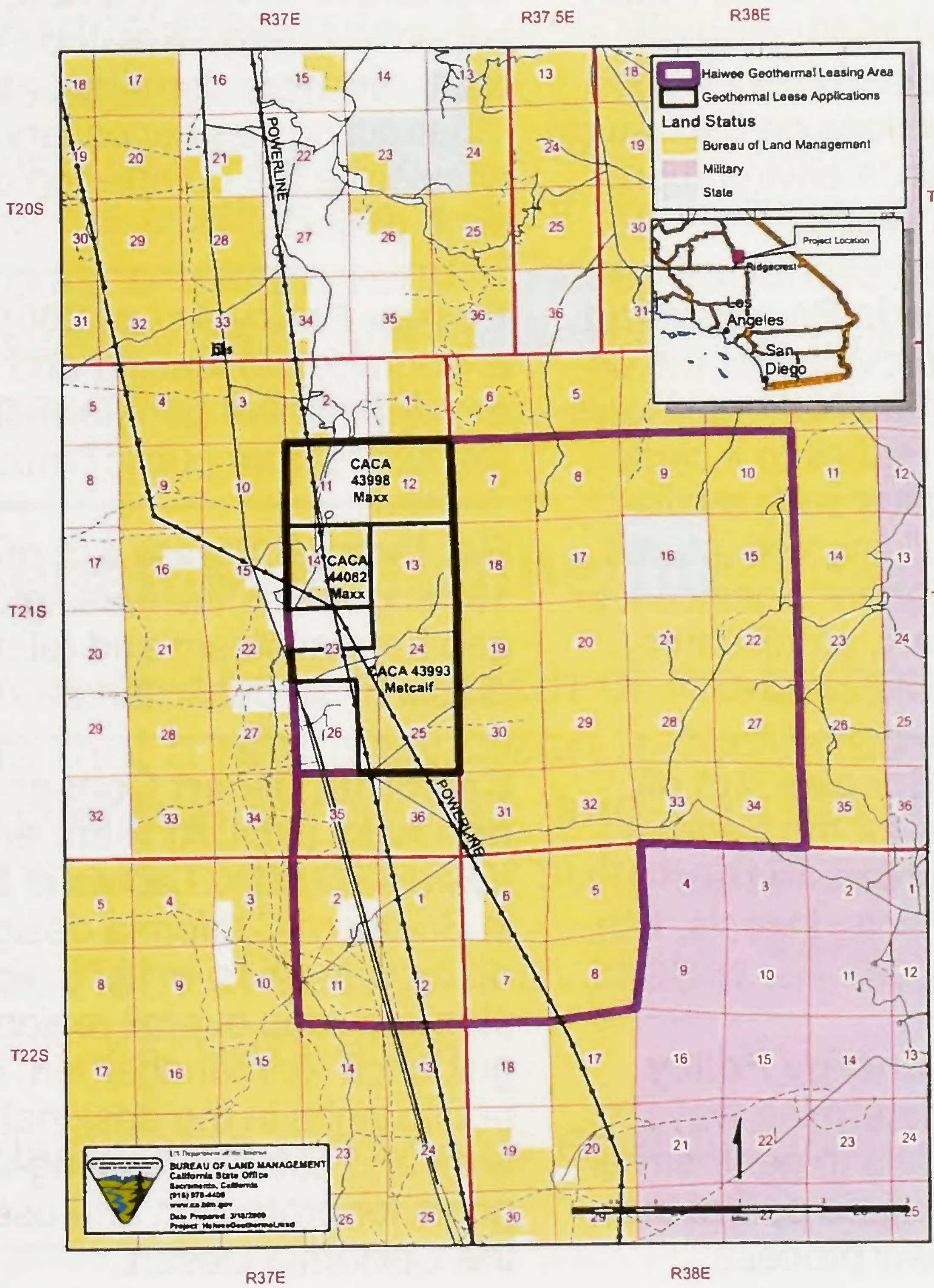
Alternatives

1. No Action Alternative (leasing of geothermal lands would stay the same as outlined in the California Desert Conservation Area Plan)
2. Leasing fewer than 22,000 acres of BLM-managed lands.

Purpose and Need

- California Desert Conservation Area Plan Amendment
- Implement Energy Policy Act of 2005
- Assist the State in meeting the Renewable Portfolio Standard

BLM Project Area Map



HAIWEE GEOTHERMAL LEASING AREA

Environmental and Energy Laws

National Environmental Policy Act (NEPA) of 1969: requires Federal agencies to review the effects of its actions on the natural and human-made environment prior to taking action.

National Historic Preservation Act of 1966: provides for the establishment of the National Register of Historic Places to include historic properties such as districts, sites, buildings structures, and objects that are significant in American history, architecture, archaeology, and culture.

Endangered Species Act of 1973: provides for the Federal protection of threatened and endangered plants, insects, fish, and wildlife.

The National Energy Policy Act of 2001: determine ways to reduce the delays in geothermal lease processing as part of the permitting review process.

Executive Order 13212 (2001): expedite Energy-Related Projects, review of permits, or take other actions as necessary to accelerate the completion of such projects.

Energy Policy Act of 2005: encourage the leasing and development of geothermal resources from public lands.

Geothermal Steam Act of 1970: governs the leasing of geothermal steam and related resource on public lands.

California Desert Conservation Area (CDCA) Plan: encompasses 25 million acres of land in Southern California designated by Congress in 1976. The plan provides overall regional guidance for management of public lands in the designated area and establishes long-term goals for protection and use in the California Desert.

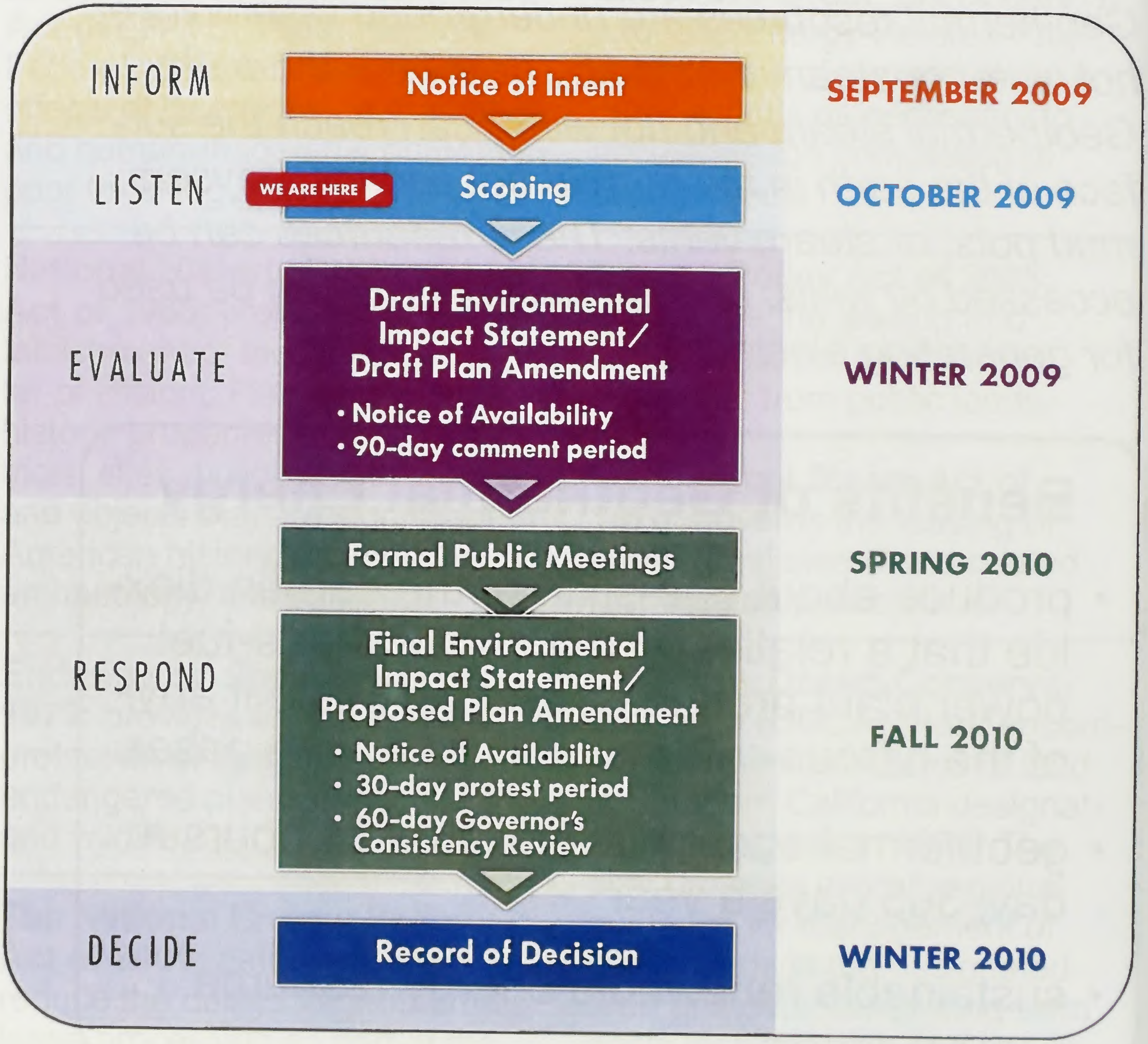
Geothermal Resources

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 can be accessed by wells, and the heat energy can be used for generating electricity.

Benefits of Geothermal Energy

- produce about one-sixth of the carbon dioxide that a relatively clean natural-gas-fuel power plant produces, and very little if any, of the nitrous oxide or sulfur-bearing gases
- geothermal energy is available 24 hours a day, 365 days a year
- sustainable renewable energy resource

NEPA Process



HAIWEE GEOTHERMAL LEASING AREA

We Welcome Your Comments

BLM welcomes your comments and input throughout the environmental review process and they may be submitted any of the following ways listed below.

email *cahaiwee@blm.gov*

send written comments to:
BLM, California Desert District Office
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
Attn: John Dalton, Haiwee Geothermal Leasing Area Coordinator

While we encourage the public to submit comments at any time, all comments (letters and emails) for consideration in preparation of the Draft Environmental Impact Statement must be received by close of business **Monday, November 9, 2009.**

Project updates will be available at
www.blm.gov/ca/st/en/fo/ridgecrest.html

HAIWEE GEOTHERMAL LEASING AREA

Scoping

Scoping is an early and open process for determining the scope of issues to be addressed, and identifying the range of actions, alternatives, mitigation measures, and significant effects to be analyzed in depth in the Environmental Impact Statement.

Appendix D: Scoping Meeting Transcripts

THIS PAGE INTENTIONALLY LEFT BLANK.

GILLESPIE

REPORTING SERVICES

Condensed Transcript
Haiwee Geothermal Project

October 14, 2009

Bureau of Land Management Scoping Meeting - Bishop, CA

Printed on: November 22, 2009

Job #: 68508DM

Gillespie Reporting & Document Management Inc.
Phone: (951) 682-5686
Fax: (951) 682-4990
Email: grdm@charterinternet.com
Internet: www.grdm.net

CD TEXT FILE & PDF ENCLOSED

BUREAU OF LAND MANAGEMENT

SCOPING MEETING

HAIWEE GEOTHERMAL PROJECT

REPORTER'S TRANSCRIPT OF PROCEEDINGS

LOCATION: EASTERN SIERRA FAIRGROUNDS
HOME ECONOMICS BUILDING
Bishop, CA 93515

DATE AND TIME: Wednesday, October 14, 2009
5:42 p.m. to 6:57 p.m.

REPORTED BY: DIANE CARVER MANN, CSR
CSR NO. 6008

JOB NO.: 68508DM

APPEARANCES

LINN GUM - Lands and Minerals Branch Chief

JOHN DALTON - Planning and Environmental Coordinator

SEAN HAGERTY - Geothermal Expert

MIKE STRAND - Project Manager

KAREN CADAVONA - Public Involvement Coordinator

BISHOP, CA WEDNESDAY, OCTOBER 14, 2009

PROCEEDINGS

-0O0-

MR. GUM: We would like to go ahead and get started this evening. Thank you all for coming to our Haiwee Geothermal Leasing Project scoping meeting. My name is Linn Gum. I am with the Bureau of Land Management in Ridgecrest. I am the Branch Chief of Lands and Minerals there. My branch is the branch these applications will come to for these kinds of activities. I'm also the Assistant Field Manager there. And tonight we have brought together a group of experts to be able to introduce to you this project. They're sitting in the back row back here, and as we go through this, we'll call them up.

The fellow in the white jacket on the end back here is John Dalton. He's the project coordinator out of our California Desert District office in Moreno Valley. The fellow next to him in the black t-shirt is Sean Hagerty. He is our geothermal program leader out of our State office in Sacramento. The fellow standing up behind is Mike Strand. He is the program manager

with our contracted services that we're using, Power Engineers, and Karen Cadavona is the public relations specialist for Power Engineers, as well, and then we have two court reporters with us. They're going to capture everything that you have to say.

I'm going to have Mike come up in a minute and go over some ground rules. I just wanted to say thanks for coming, and as we go through this evening, hopefully we'll answer your questions and get some good interchange to help us on this project. Mike?

MR. STRAND: Yeah. Thanks. So, Sean, can you go to the next slide. I'll just run through the agenda tonight real quick, what we're going to be doing and looking at and have some timeframes here. Sean is going to get up here in just a minute and go through just some basic geothermal project information, general geothermal-resource-type stuff, development of geothermal resources and a little bit of history background for this particular area we're looking at.

And then I'll get up and talk a little bit about the actual action that the BLM is looking at taking on the project, and then we'll look at this EIS, the aspects of the document we'll be writing, the EIS.

I think that will take about 20 minutes, and

after that we will open it up for comments, and if we can address your comments tonight, we're going to do the best we can to answer questions. There may be questions you ask that will be great questions and we may not have an answers for you tonight, but we're taking them down, and we will make sure they are addressed adequately in the EIS.

So you guys should all have a speaker card. If you wish to give a comment tonight or ask a question, you can just fill that out with your name. After we're done with the presentation here, I'll collect them and ask you to stand up. And you'll want to state your name so the court reporter can hear you clearly. If you can, speak slowly and loudly so they can understand you. If she has trouble hearing you, she may ask you to repeat yourself or slow down or talk a little louder.

And we don't have a lot of people here tonight, so I'm not too worried about timeframe. But you know, we'd like to give everyone a chance to ask a question. If we could limit your questions to maybe one or two and then come back and ask some more questions once we've gone through all the speaker cards. I want to give everyone a chance to ask their question here. Okay. Thanks. Sean?

MR. HAGERTY: Good evening. My name is Sean Hagerty. I'm the geothermal program lead with the Bureau of Land Management in the Sacramento office. There was a title someone gave me as geothermal expert. I'm far from an expert, but I've been around the issue for quite some time.

I started my career with BLM in Imperial Valley. I saw the development of East Mesa Fields. Now I oversee five different projects that are in California: the Geysers, most notably, north of San Francisco, big, big field; the Coso field, the East Mesa field, Mammoth Lakes and also at Honey Lake up near Susanville.

So I have a little bit of background, but as I said, I don't know everything, and tonight is a learning process for me. There may be questions you'll have that I don't know, but I'll work together to get an answer for you.

As Mike said, I'm going to go over some basics. I won't go into a lot of detail. I'll be here after the presentations. If somebody has questions about the geology or reservoir or thermodynamics or kinetics or things like that, I can try to answer some of those questions. But I'm just going to give you a brief overview of what is geothermal, where is it, how

do they find it, how to do they get it out of the ground, what is it good for, things like that. So it will be pretty generic.

When we talk about geothermal energy, we're talking about the heat of the earth, crustal heat down 20-, 30,000 feet beneath our feet. The heat itself is usually as a result of molten lava at depth. It can be a variety of other things, too, but for most of the areas around here, we're looking at a heat source that's down fairly deep.

When that hot rock source is fractured and water percolates down from the surface -- could be rainwater, could be some other water -- that water is heated, and it's that hot water that contains the energy that we're looking at here. The heat itself, the heat of the rock, is valuable, but current technology is limited as far as getting that heat out. So the water becomes a medium to get the heat to the surface so it can produce something, it can do something.

When we talk about geothermal steam and hot water and things like that, most of us know things like hot springs, fumaroles, geysers. Yellowstone is a good example of that. But there's some areas where we don't see that. There's still hot water at depth, but there

is no surface manifestation of the resource. There are no hot springs. And I'll talk a little bit about how people can find those resources even when you don't see any resource on the surface.

To access that resource, usually it's by drilling wells like a water well but much, much bigger, because you may have to drill down maybe 2,000, 4,000, 5,000, maybe even 10,000 feet to access that water. And of course, it's very hot. Water normally boils at about 212 degrees Fahrenheit at sea level, but the water we're talking about here is down very deep. It can be down over 4,000 feet. So water can actually be above 212 degrees Fahrenheit because the pressure on that water.

Going way back, thinking of my mom when she had a pressure cooker to cook vegetables, it's the pressure inside that pressure cooker that increases the boiling point of water. Same concept here is that water is very deep. There's a lot of pressure on the water, so the water might be 300 degrees Fahrenheit. Could be even higher but not boiling. Bring it to the surface, and it will make it boil.

Benefits of geothermal energy. A lot of discussion about renewable energy in California now. You hear about solar. We hear about wind. We hear

about biomass, and we hear about geothermal. One of the biggest benefits of geothermal, say, as opposed to fossil fuels, as opposed to oil or even natural gas is that there's very few things that are released from geothermal. There is some carbon dioxide, some types of carbon dioxide in the reservoirs released, but far, far less than what we have with natural gas.

It's a reliable source of energy from the standpoint that with solar, solar works great when the sun is shining. Wind is perfect when the wind is blowing. But as you think about it, in the morning, for solar, it ramps up a certain amount of voltage, and then as the sun sets, it drops down. Winds is the same thing. For geothermal, they turn the power plant on, and it continues to produce power.

And that's something that the utility is looking for so that they don't have to say, can you produce so many megawatts this afternoon? Well, it will depend on this cloud cover and whether the wind is blowing. So there's a real benefit there. Mostly the benefit is to the utility, but the benefit is to us, to you, because it makes for a reliable source of power.

Geothermal power is accessed locally. We have a resource here, and we have some transmission capacity to take the power out. In the case of the project here that we're looking at, there is a transmission corridor in that area. So it's local. It's domestic, and we don't have to import it.

And it's sustainable, for the most part. The heat of the earth will be there for a long, long time. The water issue is something else, but even at the Geysers, they have been in production for over 40 years. The temperature of the rock itself, which is about 475 degrees Fahrenheit, has only dropped a couple of degrees.

We've all done this -- most of us have done this. When we're camping, if we have a rock ring for a campfire, even the next morning, if you were to pick up one of those rocks, it's probably going to be pretty warm. It may not be scalding hot, but it's going to be hot. Once rock is hot, it stays hot. It stays hot for a long time, and that's what nature has for us at depth. So if there is hot rock there, a hot rock will be there for quite some time.

In terms of how do companies get down and find this water? What do they do? Well, there's a process of exploration where they actually, again, drill wells through the rock to get down to the water itself. These are much bigger than a normal truck-mounted water rig because now, if you're drilling

maybe a thousand feet, they may be going down much further. In some cases they may be down close to 10,000 feet to reach this water.

And you might ask, how did the water get down there? Well, because there's fractures in the earth that the water has gone down, has percolated down, much like a soaking of the ground, so it will get down to these warmer rocks and heat up.

When a well is drilled and the company has identified a resource, they'll flow test the resource out to make sure there's enough heat and volume of that water to make it commercially produceable, so now they can build a power plant that will take that fluid. Then that will become a commercial resource.

Wells. It may take a couple different wells to make sure there's an adequate supply of energy there, that there's an adequate supply of water in that reservoir. But assuming that they determine that it is a commercial resource, then there will be an environmental review by us, of course, to assess the project proposal, which might be a power plant, because from the NEPA standpoint, we want to know about the power plant, we want to know about the access roads, we want to know about the transmission lines, every aspect about that project. And utilization is that, once that

project has been completed, then the operator normally is able to go ahead and do commercial operations.

Just a little cartoon. Yeah, nothing fancy, just basically showing the heat of the earth down deep in the crust. It could be molten rock. It could be a variety of things. But the heat is conveyed up into a reservoir rock here called a reservoir rock, where water is percolated down from the sides through fractures, cracks in the ground. It's heated up, and then, although this fracture is here, usually over time the fractures will seal off. There's usually mineralization in the water much like you'll find in the water pipes and things like that.

So quite often these fractures will be sealed off to some degree so you've got water that has been trapped in here. This becomes, then, cap rock to hold the pressure in. Companies will then drill down through the ground, through the cap rock, into the reservoir to access the hot water.

In this cartoon we actually show a little power plant. The hot water is brought up through the pipe into the power plant, and if it's what we call a flash plant, they allow it to flash in the steam. In this case we are actually showing a binary power plant, which the water comes up. It's sent through heat

exchanger much like the radiator in your car. The heat is conveyed to a secondary fluid, usually a hydrocarbon of some sort, isopentane, propane. It's that fluid that heats up, turns into vapor that turns the turbine that turns the generator that turns into electricity.

Once the water goes through the heat exchanger, then it's injected back into the reservoir, probably not the same place they extracted the water, because they don't want the cool water coming in contact with the wells here. They want the water to migrate across the reservoir, picking up the heat of the rock and then come back and pick up production.

Yes, sir.

GREG WEIRICK: What's the actual surface footprint of an average geothermal plant, like the total surface area of the facilities? I mean, a couple of acres, a couple dozen acres?

MR. HAGERTY: For what we've proposed for the Haiwee project, we've done a proposal -- or an estimate of what we think that could be done. We would look at two 30-megawatt power plants. And we're saying that each 30-megawatt power plant would cover roughly about 25 acres. Now, that does not include the well field and access but the power plant itself, the switchyard, the laydown yard, a maintenance shed and all. We cover about 25 acres.

GREG WEIRICK: So about a tenth of one percent of the actual land that you're talking about opening up?

MR. HAGERTY: Right. I'll get into this a little bit later, but when we talk about leasing -- and part of the issue here is basically to lease or not to lease. If a decision is made to lease, then we have a couple of pending applications out there right now. The applications range from, I think, about 640 acres all the way up to a little over 2,000 acres, but the actual percentage of land utilized is very, very small.

It's not -- unlike solar -- I'm not throwing stones at solar, but if the solar application were to come in, if they were asking for a hundred acres and they're going to cover it with thin-film photovoltaics, they'll probably use a hundred acres, and that's what's out there. For the wind form, of course, it would be a lot less than a hundred acres, but they'd still have the foundations.

So the power plant is like this, too. A small portion of land would be used, but there wouldn't be a fence going around the entire 2,000 acres. There might be a fence around the power plant, but that's only for safety and security reasons.

Yes, sir.

GREG WEIRICK: The average temperature variance between the hot water you extract and the water you return, what is the general temperature difference there?

MR. HAGERTY: It can be several hundred degrees. In the case of a binary power plant, you might have water coming up -- and I'll talk a little bit about the various types of plants, for binary power plants versus a flash plant. A flash plant is, you bring the water up. It flashes into steam, and then it turns the turbine. In binary, you have a secondary that heats up. For that binary process, it could come up -- I'll use just an example of maybe 325 degrees Fahrenheit coming up in this direction. The injection water could be as low as 180 degrees Fahrenheit.

There's certain limitations to how low you can go with that because the lower heat you extract, the lower the temperature is on your injection, the more chemical issues you start having with the water. So you have to be careful.

In terms of the flash plant, flash plant is limited because you're trying to get as much steam to come out of the fluid. Well, it will only come out of the fluid if it's at or above boiling, and if you're at

sea level, boiling is 212 Fahrenheit. So if you have a resource of 330 degrees Fahrenheit, you're only going to take it down to, at the most, 212.

But there is benefits to both projects. It depends on -- it really depends on the temperature of the water in the reservoir. That will be the call.

GREG WEIRICK: Thanks. Just one final thing, and maybe you'll touch on this. But you spoke about the size of the plants and the footprint they have. Are you going to speak to the need for 22,000 acres and what that includes, whether it's going to include numerous geothermal operations? Or perhaps you could speak to us about why the need for such a large area for a relatively small footprint.

MR. HAGERTY: Yeah, I will talk about that. That's a very good point. Such a large area, when we talk about a footprint, it may be 50 acres. That's a good question. I kind of covered it a little bit, but let me go into more detail here.

We talked about a binary power plant. That's a power plant that, in terms of temperature, if the resource is, say, 325 degrees or less, that hot water at depth, then that would be most of what we would see for a binary power plant. Again, the water would be brought up to the surface. It's all contained

in pipe. It goes through the heat exchanger and is injected back down. When it goes through the heat exchanger -- and there's a secondary fluid that picks up that heat, turns into a vapor that turns the turbine, turns the generator, produces electricity.

A flash plant, on the other hand -- again, we're showing here about 330 degrees Fahrenheit. There are resources that will take it well over 450 degrees Fahrenheit, so there's a wide variation of resources, but roughly above 330 degrees. The economics will show that a flash plant is much better. For a flash plant, the same water that water is being brought up through the pipe, they basically bring it up through a vessel that drops it down to atmospheric pressure. It's like taking the pressure cooker and suddenly taking the lid off. It could be very dangerous in the kitchen.

That's exactly what they want to do in the power plant. They want to take the lid off, drop the pressure, and then the water will go into a portion of it that turns it into steam. It's that steam that goes into the turbine that turns the generator and produces the electricity.

There's a third type of a plant, though, that we don't see around here. It is up at the Geysers north of San Francisco and in one other place, a place called Larderello, Italy, where you actually have dry steam. This is an unusual, unique resource in that, when they drill into the rock, they don't hit any water. It's just hot, hot steam that's coming out steam that could be anywhere from 450 to 650 degrees Fahrenheit. It's gas at that level.

We think of steam as something coming out of the steam kettle. Well, that's only because of its condensation. We see a little bit of white steam. When you have steam at that temperature above 350 degrees Farenheit, you don't see it, not until it begins to condense out quite a ways. It can be quite dangerous. The good thing is, you don't have to let it flash. It already is steam, so it turns the turbine, which turns the generator, which produces electricity.

The Geyser produces about 900 megawatts of power. That's enough to cover all the city of San Francisco and most of Oakland Heights. Great resource. Unfortunately nature doesn't give us that very often.

For leasing, again, I'm kind of boiling it down as we get down to the bare essence here. The leasing of Federal Lands under the Geothermal Steam Act is considered a major Federal, action, and because of that, we must include it within an environmental

process.

Our specific regulations that deal with the National Environmental Policy Act -- and I'll talk about that Act in just a little bit -- is under 43 Code of Federal Regulations 3200, and I do have copies of those regulations on the table. In fact, I have two little piles there.

I have this sheet that is basically a reference to the Federal Register, not like people read Federal Registers, but late-night reading in case you want to go to sleep. But on this two-page sheet I do have the website. If you have access to the computer, you can access the regulations on it. If not, I also have another stack that looks like this, but it's 22 pages long. It has regulations that address everything from leasing to exploration to development.

It's important to remember, though, that our issue here is to lease or not to lease. So if a decision is made to lease -- and this document will be addressing leasing or the fact of leasing or not -- after lease is issued, if we decide to lease, then that doesn't give the company the right just to go out there to start drilling or build a power plant. When a proposal is submitted back to BLM for drilling, there will be an environmental review done at that time.

If the resource is identified as a commercial resource for binary or, perhaps, for a flash plant, then the company will come back to us with a project for a 30-megawatt power plant, a ten-megawatt power plant, so many wells, and that will also go through another environmental review. So there's a whole series of steps that will take place even if we make a decision to go ahead and lease.

I talked a little bit about some of the laws. I don't want to give you too much information here. This is just to give you some of the ideas of some of the laws that this document will be involved with. I already mentioned the Geothermal Steam Act of 1970. That's what gives the Federal government, the Department of Interior, the Bureau of Land Management the authority to lease.

But there's many, many other laws that are coming into play here. The National Environmental Policy Act, or NEPA, of 1969, that's the driving force that we have to address leasing under, and that's what this document is all about.

We get into the National Historic Preservation Act of 1966, talking about cultural resources, the importance of cultural resources and how that will also go into the document. So this is kind

of a kettle, and we put this in, the Endangered Species Act of 1973. That also has to be factored into the issue. We've got two Energy Policy acts under two different administrations. We've got the Energy Policy Act of 2001. More importantly, though, we've got an Energy Policy Act of 2005, and that's what these regulations are under right here.

The Energy Policy Act of 2005 did a couple of different things. Number one, as I talk on this map here, we do have three applications that have been pending since 2005. Excuse me. 2002. Excuse me. I stand corrected. When the Act was passed in 2005, we had two different types of geothermal leasing. There was non-competitive, where anybody could come out and say, "I'd like to lease this land right here." And then in areas where there was established production, we could have competitive sale.

In 2005 the regulations were changed so that it's all competitive. And so where this map here where -- this boundary here shows the applications. This area was considered to have some resource, potential resources. So these people could not just apply over here. So now under the current regulations if a decision is made to lease, we would consider the competitive lease applications but of this land here.

So a couple of things are going on, so I can go into more detail, but I won't for right now. If any of you have more questions, I'd be more than happy to get into this. Again, as I mentioned, the whole driving issue here is the Geothermal Act of 1970. That gives us the authority to lease this.

Now, talking specifically, let's get down to the nuts and bolts. We talk about the Haiwee Geothermal Lease Area. The area covers a total of 24,200 acres. That's what we're looking at here. To make some marks here, this is Highway 395 coming up to what's called Rose Valley. South Haiwee Reservoir, south through here. Little Lake area is down just off the map here. For those of you who know where the Coso Junction rest area is, that's right here. So we're trying to put it in perspective most of what you've seen from the road is in a swath.

That means there's tall mountains here, so this part of the area would be out to the side of that, just to put it in perspective. Besides the Federal acreage there, we also have a State section, lands that are controlled by the State of California. And, in fact, this State section is about 640 acres and has already been leased to a company, and BLM has issued a right-of-way that cuts across public land here to

provide that company access to that lease. The company has chosen not to do anything with the lease up to this time. It had the lease up to about two years, I believe.

And we also have private land out here, private lands within the Rose Valley, about 2200 acres of which we have no jurisdiction whatsoever. It's my understanding one of the proponents owns the private land, and what she wishes to do with the private land, it will probably be up to the County to make that call.

So as I mentioned, we have the three pending lease applications pending since 2002, covers about 4400 acres all together. I kind of discussed where the project area is located, 13 miles south of Olancha, east of the Inyo National Forest west of the China Lake Naval Weapons Center. That is the area here. It's kind of hard to see. The green area here is Inyo National Forest and, as I said, south of the South Haiwee Reservoir.

Purpose and need. The driving force of this project is to determine whether to approve the non-competitive geothermal lease applications. That's one purpose. Under the Energy Policy Act of 2005, one of the provisions was that it said for BLM's backlog of applications by 2010, we had to process and lease 90

percent of those applications. This activity here, this effort, is to do exactly that, to take a look at these three applications to determine, should these be leased or not? So it will address those from our backlog.

The other aspect of the purpose here is then to consider the area outside of where the applications are, the other land, to determine, should these be leased as well? Maybe they shouldn't. Maybe that's an alternative that we would consider. A question came up from the gentleman earlier as far as, why would you even want to consider these acres out here? The reason being, when these individuals applied, they couldn't apply out here because it was what we call known geothermal resource area, and according to the regulations, they couldn't apply as a competitive area.

They were very much interested in this area, as shown by the fact that they do have a lease for the State of California. So the reason we wouldn't want to consider these is because they believe that the resource they believe is here extends under the lands here.

So the concept would be that, if a decision is made to lease, we might lease some of it, might lease all of it, depending on the environmental issues

in that area.

Again I already talked about the Energy Policy Act, the Desert Conservation Plan Amendment. This document would amend the California Desert Plan, and that's an important aspect of the documents. We're looking at leasing and a Plan amendment. The original Plan did talk about geothermal leasing, but there's been amendments to that Plan since it was established in 1980, so we're going to make an amendment to address geothermal leasing and competitive leasing in this area.

Of course, like I already mentioned, the other two Energy Policy Acts. Another big issue, of course, in the State of California is that Governor Schwarzenegger and the Assembly and the Senate have driven the point home that we need to really look at renewable energy in 2010. He's asked the utilities, Southern California Edison, Pacific Gas and Electricity and San Diego Gas and Electricity to come to basically purchase upwards of 20 percent of their energy from renewable sources. That's now being bumped up to 30 percent in the year 2030. Well, this could be one of those areas where they could buy their energy from.

Do these individuals here have a contract with Edison? I don't know. I don't know. But clearly

a70437da-aceb-4e55-b95b-f8a7e8e1352e

the utilities are being put in a position where they need to get additional energy. And from things that are happening with the Public Utilities Commission, it's not going to be easy for the utilities to go outside of the state to find that energy. So it's going to have to be developed here, one way or another. So lots of stuff going on. I can get into a lot of details here, but I don't because it gets into a lot of politics. But I'll gladly talk about that afterwards.

I think I'm going to turn this over to Mike. Again I will be here throughout the meeting. If you have any other questions, I'd be more than happy to answer them. If I don't know the answer, I'll write them down and make sure I get back in touch with you. So with, that I'll turn it over to Mike.

MR. STRAND: Thank you, Sean. There's really not much more to cover. He's already touched on pretty much the remaining slides. I'll just click on these and reemphasize some of the decisions that are being made, the EIS document that we're going to be assisting the BLM in writing, what that's going to cover and what the project really is.

The project, or the proposed action, is to look at the entire 22,000 acres, including these lease applications, and again is to make a decision whether

or not to open or close that area to geothermal leasing. So one of those decisions will be made as to the proposed action, open or close it. And as part of that, that decision that will be made, we would amend that California Desert Plan. So an amendment will be made to that Plan.

And like Sean said, this Plan in 1980 has been amended many, many times since the last 29 years. There have been many Plan amendments. This will be another Plan amendment specifically for this area to, again, open or close it to geothermal leasing.

So what that means is, if it's open to geothermal leasing, then the BLM will accept those applications. Once those applications come in, they're accepted, that would start a specific NEPA process for those specific projects. So if they lease, you know, four sections over here, then they want to put a geothermal plant there, they're going to have to go through their own NEPA, a National Environmental Policy Act, process, have scoping, have meetings, write an EIA or an EIS for that project, look at the details of that project, proposing to lease it. So we're just looking at the decision whether or not to open or close that.

Alternatives to that decision would be not to take any action, and if we don't take an action to

the project, or the area, then it's going to stay the same, and it's still covered underneath the California Plan. The area, it would just be as that one in the California Plan. Those areas for geothermal will remain the same. There will be no action taken. No decisions will be made on that.

Other alternatives that we'll look at would be to lease less than the 22,000 acres. Maybe only half the area will be considered open to the geothermal leasing. That would be an alternative we'll look at that will be addressed in the EIS.

And then part of what we're doing here is -- this is called scoping. This is a scoping meeting. We're here to listen to you guys, to listen and hear your comments, your suggestions. Through this process we will produce a scoping report, and that's a report made that will address whether it's environmental issues that you're concerned about that we hear from the public or the agencies or elected officials. We'll address those in the EIS document.

There may be other alternatives we want to look at as a result of scoping, as well, so this scoping process -- we're right in the middle of it -- is going to go until November 9th. And so between now and November 9th, you have the opportunity to leave

comments here at these meetings. You can go to the website or e-mail any comment. You can write a letter to the BLM as well.

Looking at the project schedule, we're right here again in October, again, the NEPA scoping addressing comments and issues for the Draft Environmental Impact Statement. That's going to be -- well, it's currently under development and will be developed in the next several months. As soon as that is completed, that Draft EIS will be made available to the public for review and comment.

During that comment period there will be another hearing or a public meeting, maybe something similar to this, where, again, after you've had a chance to review the document, you come and give your verbal comments. You can also submit comments to draft just like you can submit comments now during the scoping period.

And then next spring we'll get into writing the final, what's considered a Final Environmental Impact Statement. And the Final Environmental Impact Statement is looking at the comments we received and our responses to those comments. That's really the heart of the Final EIS. There may be additions or clarifications made in the Draft EIS. Those would be

a70437da-aceb-4e55-b95b-f8a7e8e1352e

addressed in this Final Impact Statement as well.

And the Final Impact Statement would also include a Proposed Plan Amendment, so it's an EIS and a Plan Amendment all in one. Again the Plan Amendment is to the California Desert Conservation Area Plan. That would be included with the EIS. The language of the Plan Amendment will be in there. And then a Record of Decision late next year.

So again you're part of the process. We appreciate you guys being here tonight. If you have comments, please leave them with us here tonight, or again you can go to the e-mail. You can send an e-mail to the e-mail address right there or send a letter to the Moreno Valley Desert District Office as well.

With that, if you guys have comments or -- I'm sorry -- speaker cards, I can collect those, and we'll start our comment-and-question period.

MS. CADAVONA: Greg Weirick.

GREG WEIRICK: Hi. My name is Greg Weirick. I'm an Inyo County resident and wanted to, first of all, say I support the idea of renewable energy in its concept and would like to see the opportunity for more tax revenue for the County and whatnot.

My concern this evening is the loss of

motorized recreational opportunities due to this designation of these 22,000 acres, potentially up to the 22,000 acres. The 1985 through 1987 inventory of the roads that the BLM undertook and incorporated into NEMO, the Northeast Mojave Plan, is grossly inadequate, and a lot of that inventory is really flawed. Even roads that appear on BLM maps failed to reach the inventory.

And I need to insist that, based on the potential loss of all this motorized recreation, the BLM undertake a more thorough inventory and mitigate this loss of recreational opportunity by revisiting NEMO and potentially designating roads lost in NEMO.

I realize none of these roads are closed now, but they are administratively -- they were administratively closed in NEMO, and it merely hasn't been implemented yet. So I'd like to have BLM consider mitigating through revisiting NEMO and looking at roads that were not inventoried and consider them for designation and continued use.

MR. STRAND: Okay. And part of that comment, I think you heard you say, was, if something is developed, to mitigate the loss of that area, those roads, that access?

GREG WEIRICK: Yes.

MR. STRAND: Development in the area, 22,000 acres or whatever that would be.

GREG WEIRICK: Well, 22 acres isn't a whole lot.

MR. STRAND: Whatever development may occur in that area.

GREG WEIRICK: Right. The eventual -- pardon me. If eventually the lease does grow to be a significant amount of acreage, then I just want to make sure that BLM considers the recreation loss of that.

MR. STRAND: Okay. Thanks. That was Greg?

GREG WEIRICK: That's correct.

MR. STRAND: All right. Tanksley?

DAVE TANKSLEY: That's me.

MR. STRAND: What's the first name?

DAVE TANKSLEY: Sorry. My writing is real bad. I'm an illiterate. I'm Dave Tanksley, resident of Inyo County, and I have a couple of questions. And one of them is, how long has this process been going on to get to this point where we're at right here with the BLM, because were you guys -- I mean, has it been a year, two years, six months?

MR. STRAND: Well, the lease applications are dated -- what?

MR. HAGERTY: 2002.

MR. STRAND: The lease applications came in 2002. What's the next timeframe?

MR. HAGERTY: The critical timeframe is basically money. We didn't have adequate money to address the environmental review of those applications or even, of course, larger applications until the passage of the 2005 Energy Act. What that Act did was that it -- it takes 25 percent of the geothermal royalties nationwide and directs that into the Department of Interior, which is then given to BLM funding, producing what you're talking about right now. So there was quite a bit of lag time where we couldn't afford to look in this direction. Now we have the money.

MR. STRAND: One more thing. As far as, you know, this specific process, that's really started with what's called a Notice of Intent, and that Notice of Intent is to prepare an EIS. So that starts this NEPA process. The NOI was published -- what date?

MS. CADAVONA: September 11.

MR. STRAND: Of this year.

DAVID TANKSLEY: This will lead to my what next question is. Sean, I believe, brought up the codes and everything, which one of the documents that

a70437da-aceb-4e55-b95b-f8a7e8e1352e

you comply to was FLPMA, Federal Land Policy and Management Act, and in that it requires coordination with County government. And in that coordination process I would have thought that the BLM would have notified County government prior to the Notice of Intent, and I'm wondering where that ball got dropped in that.

In any land-use planning the local government is one of the entities that needs to be notified. I mean, this is going to affect what is on in this county. And I'd like to know why that hasn't happened. And I don't know if you have that answer.

MR. STRAND: Okay. Do you guys want to address that?

MR. DALTON: Sure. At this level this is a Federal undertaking at this point. You're absolutely right. The next step we will do is see who our partners, our cooperating agencies, are and move forward in that direction. It's not appropriate at this level to go out and say, Hey, we are thinking about doing a geothermal operation or a project area at this level.

Right now we want to hear from everybody to try to determine whether this is feasible or not. Does that make sense? So as we decide to move forward, we

will.

MR. STRAND: So there's been nothing happening, I guess. In the last couple of years there's been no action, no decisions, no progress until this point now. Now is really the point where it's like, okay. County is involved. Here's where we're looking at. This is the beginning stages of all that.

MR. DALTON: Exactly. This is the very beginning.

DAVE TANKSLEY: Okay. I still have a few more questions. We're not a big crowd.

MR. STRAND: Sure.

DAVE TANKSLEY: At what level are you considering dealing with the County, the local government as compared to what you have with the NEPA process? How does that fit into your scope of how FLPMA controls and the different CMR's, whether 30, 43, tribes, which would also be included in that.

MR. DALTON: Well, some letters have already gone out to the tribes as we speak. We have obligations through our 106 process, government to government. For instance they have until November 20th to respond and let us know what kind of concerns they have as nation. They also have the November 9th date as members of the public to respond and let us know

what their concerns are as residents and so forth.

I hope you're picking up we just started this process. Everyone will be invited, including our partners and counties and so forth.

DAVE TANKSLEY: Okay. That was one of my concerns.

MR. DALTON: Okay.

MR. TANKSLEY: Another one is, what's the estimated generated revenues? And you can make it simple. Say, a 50-megawatt plant, what percentage of that revenue will actually be directed into the County coffers?

MR. HAGERTY: Let me address that. That's a good question, as well, because it goes back to the Energy Policy Act of 2005. The Coso operations for the development there that -- at least for the portion that BLM manages, which is basically 90 megawatts, there's a lot more production than that, but the rest of the production is managed by the Navy. That's Navy contract. But for our land, there's roughly about $2 million coming off those leases every year for royalties. That's in general. I mean, it goes up and down. It has dropped over time because of a variety of issues. They take deductions on depreciation of the property.

But of that $2 million that is collected in royalties, half of that then comes back to the State of California. And of that portion 40 percent is directed back to Inyo County. Thirty percent goes into the Energy Commission for grants, some of the grants that have been utilized by Mono County, for example, or for direct use application in Mammoth Lakes. And another 30 percent goes into a riparian fund that's managed by basically the Assembly and Senate. I won't call it a slush fund, but it's hard to track where that money goes.

But more importantly, the other half collected by the Federal government under the Energy Policy Act, the statute states that half of that is returned to the county of origin. So not only is the 40 percent of the half going to the Inyo County, but roughly that comes out --

THE REPORTER: Wait a second. There's a frog near me.

(Pause in proceedings.)

MR. TANKSLEY: So roughly 45 percent of the revenue generated, and that's gross?

MR. HAGERTY: That's the royalty. You're right. Then so 45 percent of the $2 million, or roughly about $900,000, would be coming back to Inyo

a70437da-aceb-4e55-b95b-f8a7e8e1352e

County. For the projects here, we have developed what we call a reasonable foreseeable development scenario where we are giving kind of a crystal ball where we feel that perhaps two 30-megawatt power plants would be developed.

The royalty stream from those could be considered similar to Coso. So instead of two million, let's call it $1.5 million, so maybe $750,000 a year. These are just pulling things out of the air here, really, folks. So that's $750,000 a year could be coming back to Inyo County.

DAVE TANKSLEY: Okay.

MR. HAGERTY: It could be more; it could be less, depending on the resources. We don't know. We do not have any direct knowledge of the resource in this area. All we can do is basically base our estimates on what's in Coso. The proponents have said there's a resource now that's at 18,000 feet. My professional judgment, that's an awful long way to go to get to the resource. But if it's there, it's there. So that's regarding whether to make the lease or not. Does that answer your question?

DAVE TANKSLEY: Yes, it does. Thank you very much.

Sir, I have one more. It goes back to what

you were saying earlier, if you want to answer it. It was -- you had stated that, of course, with the 2005 and what Schwarzenegger signed for the renewable energy, that a lot of the majority of the renewable energy needs to come from the State of California.

But it was my understanding that Schwarzenegger shot that down as allowing that to be purchased from out of state. I mean that's, why that BrightSource has pulled their solar. So that's contrary to -- is there something that's going on that's going to make it more where these things have to be generated within the state of California?

MR. HAGERTY: I think what's going to happen is, you've got an expanding population in Nevada, and that's where there's a lot of geothermal development going on right now. The Nevada Power, Northern California and Nevada Power and Sierra Pacific Power, they do not have the percentage of renewable energy that they need to get into their mix as required by State law.

So I think what will happen is, instead of sending the power our way, they're going to say, "We need our power first. If we have excess, we'll send it to California."

So I think, when push comes to shove,

California will need to start generating more of its own renewable energy to meet these thresholds. You're absolutely right. The governor did shoot down the issue of not being able to go to another state, but I think we are finding other states are still coming up with their renewable energy portfolio saying, "We want to keep energy in our own state."

In California conservation is important, of course. I don't discount that. But the fact of the matter is that we do continue to consume electricity two, three, four, five percent more a year. We need to make it up someplace. I do think we'll see a renewable energy program.

DAVE TANKSLEY: Thank you very much.

MR. STRAND: I just want to point out, too, that in the project area there's several transmission lines. He mentioned a transmission corridor. One of them is a lower voltage line, SCE. The other two are Los Angeles lines, Los Angeles Department of Water and Power. There's no major station in the area, but those are the likely lines that the power would be put on to.

DAVE TANKSLEY: In the corridor?

MR. STRAND: Yeah. He mentioned a reasonable foreseeable development plan, which is what

we're basing our impact analysis on. Not a huge amount of power. You don't need a real large transmission line to utilize that. It's not likely they would look at building a large transmission line somewhere else to ship that power out. It's just too expensive.

DAVE TANKSLEY: Thank you very much.

MR. STRAND: You bet. Before we go on to the next person, Bob, I want to mention that over behind the blue curtain are some surprises. No. Left side, men's restroom; right side, women's restroom, so in case you needed that.

So Bob is next, Bob Harrington.

BOB HARRINGTON: I'm the water director for Inyo County. It may be fairly early in the process for this, but I wanted to alert BLM staff to the need for applicants or project proponents to get in touch with the County Planning Department early in the process to see what conditional use permits they may need under the County's Geothermal Development Ordinance or Groundwater Transfer Ordinance.

MR. STRAND: Okay. Yeah. Great. Thank you. I appreciate that. Pam Mitchell.

PAM MITCHELL: Yeah. I was wondering what type of jobs might be created from geothermal exploration and then, if it's developed and utilized,

a70437da-aceb-4e55-b95b-f8a7e8e135

what type of jobs it would bring to the area.

MR. STRAND: Okay. Sean, do you want to hit that one?

MR. HAGERTY: Yeah, I can touch on that, and then that will be addressed in the EIS. But the early part of exploration would be pretty much just technical focus, you know, drilling the well and things like that. And this makes the assumption that we'd actually issue the lease.

Let's take it out. Let's be optimistic and say that the lease is issued, they do find a resource. If a power plant is being developed, there would be quite a large number of people involved in terms of the construction of that power plant. They would come and go. I mean, in other words they would come in, build a power plant, and then a big construction force, most likely, would leave. But there would probably be in excess of -- depending on type of plant and how many plants, there could be 25, maybe 50 jobs in terms of technical aspects of people managing the power plant, managing the wells.

There still is quite a wide scope of other types of employment. But in terms of a major, like, industrial site, it's not going to generate hundreds of jobs over a long period of time. The majority of the

jobs will be up front during the development, but there will be people to manage the power plants, monitor the wells, basically manage the environmental aspects of that plant, skilled and unskilled.

MR. STRAND: Okay. Doug Hicks.

DOUG HICKS: Hi. I'm Doug Hicks. I'm a resident of Inyo County. My questions go to, was this a known geothermal resource at the time that the California Desert Conservation Area Plan was implemented?

MR. HAGERTY: Yes, it was.

DOUG HICKS: So this was restricted knowing that there was geothermal potential. And just a rough calculation. There's already been a -- what? -- a seven-year delay in -- these applications have been sitting there since 2002?

MR. STRAND: Right, right, yeah.

DOUG HICKS: So seven years and running. Exploration jobs, construction jobs, operation jobs, which would be continuous throughout the life of this project, which as a renewable resource could be forever. In addition, two 30-megawatt plants would generate about $600 million a year for our economy. I'm sorry. Sixty million a year, not 600. So given it's already been seven years, by the time this thing

gets outs of the California Desert Conservation Area, you're probably looking at ten years, and we're at a $600 million impact plus the jobs.

You know, what my point is, the California Desert Conservation Area Plan, did they do a realistic economic analysis? Was this identified as a potentially one-billion-dollar impact just for this one little section of it? I mean, I doubt it very much. But that's something that I know this county is concerned about, the residents here are very concerned about, the continued restriction of land in this county that delays projects far more than are identified during the scoping of these wilderness actions or these, you know, travel management,plans or any other kind of land use restriction, that they're grossly underestimating the economic impacts on this county. And that's my point.

MR. STRAND: I appreciate that. Thank you for commenting. Anything in that that you guys want to address at all? It's a great comment.

Okay. We'll move on. Linda Arcularius. I hope I'm saying that right.

LINDA ARCULARIUS: You did good. I'm an Inyo County Supervisor, and I want to go back to the process of coordination and recognize that, as local

government, it's really not adequate to have this just published in the Federal Register then have it noticed in the paper that we should show up for comment.

Under coordination in the mandated coordination, that process needs to start early on for local government, and it's a government-to-government relationship. It's not a partner; it's not a stakeholder; it's not a commenter. So I would just encourage you to get in contact with Inyo County, both with our Planning Department and our Water Department and our County Administrator. They all have roles in this process.

And as this goes forward, coordination mandates consistency with our General Plan. So we need to be involved early as local government and be a part of the process and a part of the final documentation on this project, not a comment or after the conclusions have been made. So I just encourage you to do that.

I've got my address here. We certainly are a local government. You can find us anywhere. But we're very, very interested and are completely committed to the fact that coordination needs to begin on this, and it needs to begin sooner than later. So thank you.

MR. STRAND: Thank you. I appreciate

that. Last one I've got is Sally Manning. Oh, right there.
SALLY MANNING: Yes, I'm Sally Manning. I'm here representing the Big Pine Paiute Tribe. I'm the environmental director. I had a question first about a project we used to call Deep Rose. Was that located on that 640 acres of State lands?
MR. STRAND: I believe so, yes.
MR. GUM: Section 16.
MR. STRAND: This right here (pointing).
MR. HAGERTY: And it also includes the three applications that are pending just on the left side there too. That's also part of the Deep Rose.
MR. STRAND: It's the same applicant.
MR. GUM: Let's not confuse her. On Section 16 there is an application by Deep Rose to drill a well on that State section. The State did an EIR, Environmental Impact Report, on it. The Bureau of Land Management did an Environmental Assessment. They had to come to BLM to get rights-of-way for a road and a pipeline to serve that particular location.
The other things that he's talking about, these pending applications, the only tie they have to Deep Rose is that Deep Rose is the one with the applications pending, same company. But those two

things are not tied together, not the State section and the BLM applications. They are not tied together, the ones on the State.
SALLY MANNING: Okay. My other comment is similar to those made by others this evening, although it's from the perspective of an Indian tribe. The BLM does have, as you know, certain obligations, Section 106 under Consultation Process, and I am not an expert. The expert from our tribe on this, he couldn't be here tonight because he's not feeling well.
But I did want to point out that we found out about BLM's Notice of Intent from someone from the public, from a friend. And we should have known about it as soon as it hit the streets through this formal consultation government-to-government process that you are supposed to have with the tribes, all of the tribes in Owens Valley area and, of course, the Shoshone. And when we first got the Notice, comments were going to be due this Friday, so that really didn't give much time.
On October 1st many of us within the tribes attended a meeting locally with the BLM, which included a fellow from the Moreno Valley office of BLM, and it turned out that that person who is their archeologist and tribal liaison also didn't know about this project. We knew because of our friend notifying us.

So I'm just pointing out that the process does seem to be a little bit flawed in terms of getting to the people that you're supposed to get to early on in the consultation process. I'm raising this concern because, as you go further in this process and NEPA needs to be done on further parcels, the tribes would like to be notified in a timely and appropriate manner. Thank you.
MR. STRAND: Thank you. Okay. That's all for this. You've got one. Say your name.
JIM SCOTT: Jim Scott from Bishop. The question I want to ask again of Sean is, is that Energy Policy Act of '05 -- do I understand it that you guys are required or mandated to take action on these lease applications from '02; is that correct?
MR. STRAND: Yes.
MR. HAGERTY: That's correct, sir, yes.
JIM SCOTT: Can I assume or we assume that without that mandate, we wouldn't be here right now? There's a good chance we wouldn't be here right now?
MR. HAGERTY: That is correct.
JIM SCOTT: Now, if you do not comply with this mandate given to you, what happens?
MR. HAGERTY: There is a chance the

funding --
JIM SCOTT: You guys will lose your job?
MR. HAGERTY: I'll retire.
JIM SCOTT: I'm just kidding.
MR. HAGERTY: Sir, I don't know. I don't know. The chances are the funding we are currently receiving to do this project and to look at other projects in the Imperial Valley could be minimized, and that would bring our process to -- it would slow our process down.
JIM SCOTT: I'm trying to understand that. Now, if you get slowed down, then our economy could potentially get affected right here. That process would not be a penalty to you, but it would be a penalty to our county and to the --
MR. HAGERTY: Conceivably, yes.
JIM SCOTT: Okay. Now, if someone else -- going along with that policy and the mandate, if someone else puts in -- applies for a lease, what is the time limit on them, like if someone wants to do it after '010? Do you have a year, or do you go through this procedure where we get another Energy Policy around 2011 or 2012 or so and then you get a ten-year job on that? You see what I'm saying?
MR. HAGERTY: Absolutely.

a70437da-aceb-4e55-b95b-f8a7e8e13

JIM SCOTT: I don't know how that policy is worded, but if that's a mandate to you, things ought to be -- what I'm saying is, this shouldn't happen if you're in the business of producing energy, if you are in the commercial business of doing this. And you're not the only entity that our county gets involved with on this. But I'm just asking questions that I think need to be addressed.

MR. STRAND: Well, I'm sure you guys can give some history maybe on this, but let me just make one point to your second comment. Once this decision is made to open or close, that will help greatly with those applications in the future that come in; right?

So let's just say the decision is made to open the entire 22,000 acres to geothermal leasing. Those applications will come in, be processed, start their own NEPA process for that project. This should happen just as soon as they can process that application in.

If it makes sense, they will start that NEPA process. There shouldn't be any foreseeable delays in that. This decision will help that, you know -- what I'm saying is, in the future they have to slow down, stop, look at the entire area and say, do we want to open that up for geothermal leasing? They may say they

want to close it.

JIM SCOTT: Okay. Another question, that blue State lease there, can you explain what the State lease is, or what is that?

MR. HAGERTY: Sure. Independent of BLM, of course, there's lands in the State of California that are managed by the State, specifically the State Lands Commission. When California became a state, there were two sections in every township, 36 sections that were awarded to the State of California. Section 16, in that case, and Section 36, unless the sections were already previously encumbered with something.

So in this case the company Deep Rose, since it is a State section, applied to the State Lands Commission for an actual lease to explore, and the State of California went through their own environmental process independent of us to process whether they should issue a lease or not. The final decision was that they issued a lease for -- how long? How many years is it? Thirteen years?

MR. GUM: From the time that their approval was made, I thought they had -- I think it's two years. It might be three years. I'm not sure. And I think it's actually three years, because I think

they're running up to their end time right now. And that's part of the issue that's pushing them to try to get this mandate, if I may jump in for just a second.

Well, it's funny, this 2005 Energy Policy. You know, oftentimes we in BLM get given directions by the Congress and the people of the United States to go do something, and most of the time it comes with no dollars attached to it. And so things languish because, how are you going to do an environmental impact statement that may run you half-a-million to a million-and-a-half dollars when you don't have two dollars, yet alone a million or a million-and-a-half?

So that's kind of where this runs down here. Why do things languish like that? We could wind up being in the same mode, just like you say. Even though Mike up here says yes, if we decide to open these up to leasing and we get an application in, remember those acres that are outside the area that is designated as the non-competitive lease -- those are the ones Deep Rose applied for -- those will all be under competition. So you might have the Lone Pine Tribe decide to compete for a lease, and somebody else out here -- you, as a person -- might want to compete for a lease. You get into bidding process.

Now, after you've got that lease awarded to

you, now you've got to come in with an application to do all this stuff we're talking about doing: developing that field, drilling those wells, making that power plant. And we've got to go through that environmental process again for each one of those sites specific to that location. So you could be seeing quite some time pass if we don't have the resources assigned to us to be able to conduct those types of analyses.

To be sure, we are now in cost-recovery mode, which means, when an applicant comes in, we sit down first with them one time, give them a free shot at us, and we'll tell them what all is going to be required of them. And then the very next thing we do is, we create a memorandum of agreement between us and that company, and we let them know, you're going to have to pay for every hour of our time we spend on this. You're going to have to hire third-party contractors to go out and do the biological study, to do the cultural study, to create the environmental document, just like we're doing for this leasing. So we pass the cost mostly on to those applicants at that point in time, but they've still got to have BLM to do that and issue their right-of-way grant. So it's quite a package overall.

a70437da-aceb-4e55-b95b-f8a7e8e1352e

It would not be unusual to see an application coming in, if these are leasable, to take anywhere from a year and a half to maybe three years to work through a process to get a permit and go out and start. So just be aware.

MR. STRAND: These guys, like you said, they can drill out here tomorrow, and they're not.

MR. GUM: They sure can, and they could have since -- 2006 is when they got their permit, and I think it's three years they had to turn it to the right.

JIM SCOTT: After that three years they've got to --

MR. GUM: They've got to go back and do it again.

JIM SCOTT: Okay. Thank you very much.

MR. STRAND: Any other questions? Anybody want to hit us up with anything else? We'll be here for a little while longer. Take a look these a little closer if you want, the boards. If you want to ask us specific questions one on one, we're happy to do that.

PAM MITCHELL: What's next after the Monday, November 9th, you know, the scoping thing that -- when is the next?

MR. STRAND: This is the second scoping meeting. We had one last night in Lone Pine. There will be a third one tomorrow night in Ridgecrest. Next Tuesday, the 20th, there will be one in Death Valley and then scoping comments.

We're asking you to submit your scoping comments to us. If you gave them to us tonight, they're already in, or if you haven't given them to us tonight, if you want to submit anything else, give them to us by November 9th, please.

PAM MITCHELL: Thank you.

MR. GUM: We also want to let you know that, although we'd like to have them by November 9th, as we go through this process, we'll open and willing to take those comments all along. We're looking at them by November 9th so we can focus our effort to create this document.

PAM MITCHELL: Sure.

MR. STRAND: Absolutely. Thank you guys.

-0O0-

(The proceedings were concluded at 6:57 p.m.)

REPORTER'S CERTIFICATE

I, DIANE CARVER MANN, a certified shorthand reporter, do hereby certify that the foregoing pages comprise a full, true and correct transcription of the proceedings had and the testimony taken at the hearing in the hereinbefore-entitled matter of BLM Scoping Meeting for the Haiwee Geothermal Project

Dated this 20th day of November, 2009, at Chino, California.

____

DIANE CARVER MANN, CSR NO. 6008

THIS PAGE INTENTIONALLY LEFT BLANK.

GILLESPIE

REPORTING SERVICES

Condensed Transcript
Haiwee Geothermal Project

October 13, 2009

Bureau of Land Management Scoping Meeting - Lone Pine, CA

Printed on: November 22, 2009

Job #: 68507DM

Gillespie Reporting & Document Management Inc.
Phone: (951) 682-5686
Fax: (951) 682-4990
Email: grdm@charterinternet.com
Internet: www.grdm.net

CD TEXT FILE & PDF ENCLOSED

BUREAU OF LAND MANAGEMENT

SCOPING MEETING

HAIWEE GEOTHERMAL PROJECT

REPORTER'S TRANSCRIPT OF PROCEEDINGS

LOCATION: Boulder Creek RV Resort
2550 South Highway 395
Lone Pine, CA 93545

DATE AND TIME: Tuesday, October 13, 2009
5:40 p.m. to 6:58 p.m.

REPORTED BY: DIANE CARVER MANN, CSR
CSR NO. 6008

JOB NO.: 68570DM

APPEARANCES

LINN GUM - Lands and Minerals Branch Chief
JOHN DALTON - Planning and Environmental Coordinator
SEAN HAGERTY - Geothermal Expert
MIKE STRAND - Project Manager
KAREN CADAVONA - Public Involvement Coordinator

LONE PINE, CA TUESDAY, OCTOBER 13, 2009

PROCEEDINGS

-0O0-

MR. GUM: Good evening, and welcome to our public scoping meeting. My name is Linn Gum. I'm the Assistant Field Manager and Lands and Minerals branch chief in the Ridgecrest BLM field office, and I'd like to introduce this team. We're here to talk to you about a proposal for leasing some 22,000 acres of public lands for geothermal exploration, production, development.

Next to me is John Dalton. He's the project coordinator/program manager for this particular EIS effort. He's out of our Moreno Valley office from the California Desert District. Next to him is Sean Hagerty --

MR. HAGERTY: Hi.

MR. GUM: -- who is our geothermal resource program leader from our State office in Sacramento. And next to him at the end of the table is Mike Strand, who is with our third-party contractor, Power Engineers, Inc., that's helping us

develop this Environmental Impact Statement/ Environmental Impact Report. And back here in the back of the room standing is Karen Cadavona, who is the public relation specialists with Power Engineers. Is that close?

MS. CADAVONA: Yes.

MR. GUM: Okay. With that I'd like to introduce Mike, who will go over our agenda and our ground rules for the meeting, and we'll proceed.

MR. STRAND: Well, the first part of the meeting we'll just have PowerPoint slides prepared for you guys, and it's going to take us through the background of the project, why we even have an EIS project to look at. It will take us through that. The purpose of the meeting and need will be discussed for the project, the EIS, the proposed action, the alternatives. And Sean will be presenting most of that information, as well as just some geothermal information, geothermal as a resource, geothermal plants, just some basic information on that.

Then we'll go through some of the environmental laws, the EIS follows -- that we'll have to follow as we're developing the EIS and then the schedule, the NEPA process we'll be following, as well. Myself and John Dalton will be going through

some of that information.

Yes, sir.

RICHARD CERVANTES: For the record I'm County Supervisor of the Fifth District of the southern part of Inyo County, and this is Janice Roberts, who's representing the Tribe too.

MR. GUM: Mr. Cervantes, could you give the court reporter -- we're getting all this taken care of here -- your name fully.

RICHARD CERVANTES: My full name is Richard Cervantes.

JANICE MC ROBERTS: Janice McRoberts. It's J-a-n-i-c-e M-c R-o-b-e-r-t-s.

MR. GUM: And you are representing which tribe?

JANICE MC ROBERTS: The Lone Pine Tribe.

MR. GUM: Thank you so much.

MR. STRAND: I appreciate you guys being here. A couple of housekeeping items to go through. After the presentation is done -- it's going to only take about 15, 20 minutes to get through. You guys, when you walked in, if you don't have one, they are over by the door, speaker cards. If you could just write down your name on there, and then I'll collect those from you guys. Afterwards you'll be able to

8dabf72c-92b9-44b6-b3ea-e1e2e3303f90

give a comment, ask a question. The court reporter is here to take that down verbatim.

And if we can answer the questions, we're going to do that here tonight. If we can't answer the questions, we'll let you know and address it in the EIS. There's also a back sheet with some basic information on the project, a map, as well. And then some notices that have been posted for the EIS are available over there, as well, and this notice on the front here is just to point out that the scoping time has been pushed out from -- I believe it was October 16th. That's been pushed out to -- November 9th is the time period where we're collecting scoping comments.

So we'll collect comments here tonight, or if you'd rather, you could go and send an e-mail, or you could write a letter. And all that information is here for you, as well as how you can read those comments.

So when I collect your speaker cards, if you want to leave a comment or ask a question, if you want to do what you just did, which is state your name and then speak loudly and clearly so the court reporter could hear you, we would appreciate that.

Okay. Shall we get started, Sean?

MR. HAGERTY: Good evening. My name is Sean Hagerty. I'm the geothermal program lead with BLM in the Sacramento office. So my title is "geothermal expert" on the card. I'm clearly not an official expert. I have been in the program for about 29 years. I've worked in the Imperial Valley on projects at East Mesa. I've been involved on projects at Geysers, Mammoth Lakes, at Coso and also Northern California at Glass Mountain.

I'm just going to go over some brief stuff. I won't go into any real particular detail. I will be around later on after the presentation, so if you ask specific questions, I'll be more than happy to answer them the best I can.

Geothermal energy. Again we're talking about heat of the earth. We are talking about heat that's within the crust of the earth. It's natural heat coming from radioactivity down deep. The resource that we're hoping is out here is both a combination of heat in the rock, as well as water. So water is very important because it is the water that actually conveys the heat from the rock to the surface.

We know that it's geysers, fumaroles, mud pots, other manifestations. In this project here,

though, we don't see any manifestations. There may be something at depth. We don't know for sure, but clearly in this case there is no surface manifestation like you see at Yellowstone.

To access that resource, wells would have to be drilled in order to get down to that level, whatever that level might be. It could be over several thousand feet; it could be over 10,000 feet. We don't know for sure. But before anybody would do that, we'd have to approach the leasing aspect.

Benefits of geothermal energy. Of all of the renewable resources --

THE REPORTER: Can you speak up, please. The birds are loud.

MR. STRAND: The birds are a little loud.

RICHARD CERVANTES: Could you speak up, please.

MR. HAGERTY: One of the greatest benefits of geothermal energy compared to solar or wind is that it's what they call a base load. You turn the power plant on, and it stays on. Solar is really good when the sun is shining. Wind energy is great when the wind is blowing. But those two energy sources do have basically an oil type of energy curve,

whereas geothermal, it stays flat. And that's what the utilities are looking for, because that's what's really important in the power mix. It's reliable. As I said, once you turn the plant on, the plant normally will stay on unless there's mechanical problems. So it's accessible locally.

Again it's a resource that we believe is here. It goes immediately into the grid. There's no other conversion necessary. Solar, you basically have to step up the power. Geothermal the turbine actually turns at 60 cycles and can produce power directly into the grid.

And it's sustainable. The heat of the earth is there. Issues with water, of course, those are things that may be utilized, but the heat of the earth will remain. A case in point is that at the Geysers, which have been operating for over 40 years, the overall temp of the rock has only dropped about five degrees. There's a tremendous amount of heat. And we all know that, if you've been camping and you have a campfire and the stones circling the fire to protect the fire from getting out, even in the morning most likely, you touch the rocks and the rocks are still warm; they retain the heat for a long, long time.

In terms of what do we think could happen, if a decision is made to lease -- and that is a decision to lease or not to lease -- we'll get into that a little more -- is, how do they access that resource? Well, the first action that we probably would see is that the company would want to drill a well, drill a well down through the earth much like a water well but much, much bigger, to drill down thousands of feet. It could be three, could be four or 10,000 feet. We don't know because we don't know exactly where this resource is in relationship to the surface because, again, there's no surface manifestation of this there.

But if a resource is identified, then the project proponent and the lessee may come forward with a project for building a power plant. That power plant could be of various sizes. In our assessment we have identified up to two 30-megawatt power plants. Each megawatt is capable of providing energy for about a thousand people, so about 60,000 people is what we feel is something we might be able to go by.

At that stage, when the project proponent comes forward, we would undergo another level of environmental review. So first we're talking about this environmental review just to decide to lease or

not to lease. If the decision is made to lease and the project proponent is granted the lease and they come forward with a project to drill, then that will undergo another environmental review and so on and so on.

It's important to remember that, because some people feel this is the only environmental review to be done. No. This is just a make a decision to lease or not to lease. And once a power plant is constructed, of course, then we're actually utilizing the resource.

Normally the hot water or mixed hot water and steam is brought up. It's flashed into steam, more additional steam. It turns the turbine, which turns the generator, which produces electricity, and out it goes. As far as any power plant, coal fire or gas fire or other fires, basically we're using the heat of the earth as the energy source. Once we've heated the water up, basically it's the same as any other power plant. It's basically using some sort of motor force that turns the turbine that turns a generator that produces electricity.

Just a real quick little sketch as far as what we believe to be at depth there. There it goes. Okay. We're talking about the heat of the earth. It

could be down maybe 10,000, 15,000 feet. It will heat up rock above it. Here is a magma source, and clearly in the coastal area history has shown that there has been magmatic activity in the past, thousands of years ago. That's why you see some of the hills in the area, some domes. Magma has come up to the surface. It's actually seen south of Little Lake here. That's the salt. And actual lava has come out so that the heat of the earth has been injected up through these rocks here.

Water is percolated down, gets through the rocks. And in order to access that heat and that water, people will drill down through a cap rock that keeps the water at depth and then it brings it up. It's flashed into steam. It's cooled back down and reinjected back into the reservoir.

This is simple, kind of common to look at. We do show some faults in here. Unlike oil and gas, which oil and gas has reservoirs that are pretty much permeable, like a sponge, so lots of little holes that are connected. So geothermal, that access to water is all controlled by fractures. The more fractured, the more permeability, how the water flows through the rock. Very rarely will we actually have a geothermal resource that is like a sponge. Normally it will be

like a fractured rock.

The three main types of power plants for current technology as we know it: We've got binary plants, flash plants and dry steam plants. We'll go into a little detail here. Binary plant basically takes hot water out of the ground, sends it through a heat exchanger, like a radiator in a car, and it heats up a secondary fuel, isopentane or isobutane or some other fuel. That vaporizes, turns the turbine, which turns the generator, which turns into electricity. The cooler water, then, after it's gone through the heat exchanger, is injected back into the ground.

For a flash plant, depending on the temperature, if it's above, say, 350 degrees Farenheit for the hot water coming up, it's brought up to the surface, and it's put into a bigger container to allow the steam to flash. An example is my mom. We had a pressure cooker, and she was cooking vegetables and things like that. Water under pressure will have a higher temperature before it boils, but if you were to take that lid off the pressure cooker quickly, you'd have that water boiling.

And that's what's happening here for the flash plants. The water that is under pressure, we call it hydrostatic head under pressure. When you bring the water up to the surface, that pressure is relieved and the boiling point increases, flashes into steam, and that's what happens in the flash plant.

For dry steam there's only a couple of places in the world we actually find dry steam. For these other plants they drill a hole into the ground, bring up hot water, but places like Larderello in Italy, there's actually just dry steam. There's hot steam. It's above 212 degrees Fahrenheit. It's a perfect resource that you just drill into a rock, allow steam to come out, turn the turbine, turn the generator, and it's electricity.

But most likely what we expect here at this resource would be something amenable to a flash plant, maybe to a binary plant. It always depends on the economics of the project.

Leasing of geothermal resources. It's a major action, and that's what's triggering off the requirement for the National Environmental Policy Act, the document that we're going to prepare, the EIS. The Code of Federal Regulations, Part 3200. I do have copies of the regulations back on the table there. I have a full copy of the regulations. If you would like to take a copy, please do.

If you have access to a computer, I also

have a website that you can actually go and at your leisure pull up the regulations. One has two pages; the other one has about 30 or 40 pages.

If the decision is made to lease -- and that's the pivot point here for this document -- if a decision is made is lease, then once a lease is issued and then the company comes forward, to do anything, there will be a subsequent environmental review conducted. So the actual lease document itself conveys the right but not the right to access the land. It gives them the right to access the geothermal resource but only after environmental reviews have been done.

Here's just a laundry list, and I'll step out of the way here. These are some of what will be addressed in the EIS. As I already mentioned, the National Environmental Policy Act of 1969. That's basically the umbrella document that we are operating under. We've got the National Historic Preservation Act of 1966, Endangered Species Act of 1973, the National Energy Policy Act of 2001 under previous administration.

I'd like to make a note of the Energy Policy Act of 2005. That Act created a new set of regulations that addressed geothermal, and those are

the regulations I have on the table at the back there. So that Energy Policy Act also allowed for the nomination of lands, a variety of things.

The other important thing that's driving this is that we do have three applications that are pending. On the map here there's three modifications that were filed back in 2002. And that is the driving force for this document, because in the Policy Act of 2005 it says, BLM, for your backlogged applications of geothermal, you must basically process 90 percent of those by 2010. And we're approaching it, so the driving force for this project basically are the three applications that are pending.

We also included a larger area outside just because, in case there is a resource in that area, we'd want to sweep out the rest of the resource, just so we could address it under one document as opposed to piecemealing it under several documents, which is not appropriate under NEPA.

So again applications in 2002, Energy Policy Act of 2005. Money is coming in as a result of variety of issues of Congress, and we're moving ahead with this document. And of course, the Geothermal Steam Act of 1970, that's what covers the regulations. That's what gives the authority for the Department of

the Interior and the Bureau of Land Management, whom we work for, the authority to lease.

Just talking again, the size of the entire project area covers a little bit more than 24,000 acres. Of that a little over 22,000 are public lands. We do have some State lands involved. That one State section, 640 acres, currently is leased. The California State Lands Commission has commissioned a lease to a company. They have taken no action on that at this time. And there's also about 1220 acres of private land that we don't have any authority over. Again I mentioned the three pending applications covering about 4400 acres of the 22,000 acres that we have.

Project map. We won't go any detail here. That map is also on the back table, if you'd like a copy of that. It's nicely colored, and on the back of that map is the legal descriptions of all the parcels.

Purpose and need. I'm going to let John. John, would you like to address that.

MR. DALTON: Or would you?

MR. STRAND: Sure. Yeah. Like Sean said, the purpose is really to determine whether or not the area will be open to geothermal lease. The entire 20,000 acres, as well as the three applications

8dabf72c-92b9-44b6-b3ea-e1e2e3303f90

that the BLM has received, those were non-competitive leases that they've received those applications. The decision within this document, the proposed action will be to approve those applications and open up the entire area to geothermal leasing. Once that happens, then those individual projects would go through their own separate NEPA analysis, which is what we're doing here today. Yeah.

RICHARD CERVANTES: Would you give us an idea, orientate the map to some landmark or something so that we could kind of have an idea of where it is.

MR. STRAND: Yeah. You know what? I've got another.

MS. CADAVONA: This is a little better.

MR. STRAND: I'm trying to think of a spot on here. There's Little Lake. It's just, I believe, off the map, just south of this southern border of the map. That doesn't really help too much. This line here going through is the highway. You see this vertical line. There's also some power lines that are parallel here.

MR. HAGERTY: Coso Junction, if that's familiar, there's a rest stop there and a Chevron gas station.

MR. CERVANTES: Okay. So it's north of

Coso Junction?

MR. STRAND: Correct, yeah.

MR. HAGERTY: There's a rest stop up over here.

MR. STRAND: Yeah. The Haiwee Reservoir is up in this land here. Little Lake is off the map. Coso Junction, right there. And so he's talking about the Coso geothermal areas. Those are right over in this area here by China Lake there. Most of those roads lead to that area.

So geothermal, in general, is going to do a couple of other things. Of course, the State of California has renewable portfolio goals. That was just in the news again last week with the governor signing into laws these renewable portfolio goals. So much percentage that the utilities of the state needs to meet in their overall mix by 2010. So for opening up additional areas to more renewable resources, geothermal is a great one that allows utilities to tap into the developers' projects and bring that geothermal and that renewable energy load to the load centers, Los Angeles, San Diego, wherever it may be.

And it also implements, like Sean mentioned, too, the energy policies from the Bush administration that were set in place 2001 and then

the actual Energy Act that came out in 2005.

So that's the purpose and need for the project, and I kind of skipped ahead here. I was talking about the proposed action, as well, here. But the proposed action would be to, again, open those entire areas, open up to geothermal leasing the entire 22,000 acres, approve the applications on the three geothermal projects. It wouldn't approve the projects; it would just approve the applications. And there would be an amendment to the California Desert Conservation Plan, as well.

And then also according to NEPA, we would look at alternatives to the proposed action, and we have two. We've got a no action, and we've got a second alternative. And John, do you want to explain the no action one.

MR. DALTON: Yeah. The no action basically would be consistent with our Land Use Plan. So I won't go into great detail on that. So we have the no action. We're most likely going to have to lease only those pending lease applications, lease all of the lands to geothermal exploration or close the lands to geothermal exploration. So again an amendment to the California Desert Conservation Plan, so that is our proposed action. The no action, which

is a requirement through NEPA, will be to be -- nothing would change. It would be consistent with our current Land Use Plan.

And like I said, we hope to develop more alternatives, especially through the comments. We hope to get more and be able to analyze the comments through this process.

MR. STRAND: Okay. And so that's a good lead into what we're doing here tonight, which is scoping. And scoping is just a way for us to hear public comments. It's not just public but also agency comments, elected officials' comments on the project itself. And like John said, it does a couple of things. It will help shape the Environmental Impact Statement, the EIS that we're setting off to write. Right now we're getting ready to start those environmental studies. And that will package in the alternatives that we have listed up here tonight, the proposed action plus the alternatives here.

If we hear comments about other alternatives that we should, perhaps, address in the EIS, we will consider those, and those will be addressed in the document. So all of your scoping comments that you give to us tonight between now and November 9th would be addressed in some way in the

Environmental Impact Statement, again, tonight, e-mail, written letters, however, you may send those in.

And so looking at the timeline of the project, the calendar here, we're just really at the beginning stages of the project, of the EIS, scoping. That's us here tonight, and that will continue for another few weeks. We've got several more meetings planned this week and one next week, and then that leads us right into developing what we consider a Draft Environmental Impact Statement. And this is all NEPA, National Environmental Policy Act, language, which spells out an EIS, when an EIS needs to be prepared, what should be included in an EIS. So we're really at the beginning stages of that. There's several more opportunities for public comment.

STEVE MC LAUGHLIN: Can I ask a question?

MR. STRAND: Sure.

STEVE MC LAUGHLIN: My name is Steve McLaughlin. What exactly is the project?

MR. STRAND: The project. "Project" is not the best word, really, for it, because we're not necessarily proposing to build anything with this, you know, in the normal sense of what you consider a

project. But in this case the project is -- or the actions, really -- the Federal action, really, on this is to open up this entire area, this 22,000 acres that's within this boundary, open that up to accepting geothermal lease applications.

So if a developer wants to set up a geothermal power plant within those boundaries, what this process will do, if the proposed action is selected, it would accept that application. It would open it to geothermal leasing. And once that be application is accepted, then that project would undergo its own environmental review and a separate approval process.

But this is really just to amend the Area Plan to set aside this area to accept geothermal applications. It would also approve the three applications that we've already received in this area. That's what these three are.

STEVE MC LAUGHLIN: Thank you.

MR. STRAND: So that's what the action of this would approve.

Yeah. You had one question. Could you say your name.

KATHY GOSS: Kathy Goss. I live in Darwin. I'm sorry. I apologize for getting here

late. I just heard about the meeting. I thought it started at six.

Have you provided us with a description of the geothermal resources that you are talking about here, what's there, what's known to be there and also whether you plan to inject cold water into that area as is being done at the Coso plant and what the consequences of that might be?

MR. STRAND: Okay. Can I do one thing? Can I just hold your question for just another five minutes, and if you have -- do you have a speaker card? What we're asking people to do is to fill out a speaker card. Another two or three minutes, I'll call on you. That's a great question. We'll be happy to address it. In a couple minutes we'll get to those very specific questions. Thank you.

Let me just finish this off. I've got one more slide after this, and we'll be done. Then we'll get into the good stuff, the questions.

So Draft Impact Statement, that will be developed over the winter, 2009 into early winter, 2010. It is projected to be available spring, 2010, so the next, you know, April, May timeframe it will be ready. And there will be notices that will go out that will say it's available for public review.

During that public review period, that's another chance for you guys to participate, to review it, to give comments back to us on the document itself, some very specific questions that, you know, you're talking about, the environmental review that was done on the project, the alternatives that were addressed on the project, whatever you want to address.

There will also be another meeting, probably something very similar to this, that you can attend, and again notices will go out on those. You can attend those and give comments on the draft itself. Part of that draft document, you mentioned that we're going to amend the Area Plan, that California Desert Conservation Area Plan. That Plan amendment will be attached to that document, included within that document.

After the public comment period we'll issue out a Final Environmental Impact Statement, and the Final Environmental Impact Statement will include any changes that were made to the Draft Impact Statement that you'll have a chance to review, and then it will also have the public comments received during the public period on the draft and then responses to those comments.

So that's really -- the meat of the final

8dabf72c-92b9-44b6-b3ea-e1e2e3303f90

is really the comments and the responses to the comments and then any particular changes that were made to the document itself.

And then after that there will be a decision made on the project, and we're expecting that all to occur in 2010. So late 2010 we should expect a Record of Decision, or a ROD, it is referred to, and that will also refer to that proposed Plan amendment.

So again there's lots of ways to be a part of this process. We hope you want to be part of the process. There's e-mail. There's a physical address you can send a letter to. There's website set up; we'll post project updates on that. We'll also post the project documents on that website as well.

So thanks, you guys. That's all we had planned for the presentation. We can jump into any specific comments you want to ask. If you guys want to hand me your speaker cards, I'll take those, and I'll just call you up as I grab them here just randomly. Any more? Okay. Did you have any more comments?

RICHARD CERVANTES: Yeah. I had some questions. I've been involved with geothermal for a long, long time, and being a County Supervisor going on six years, have toured the plant. And I understand

the basic workings of it. I'm totally familiar with the mechanical engineering part in that in my business career, my company -- we made central plants. We built central plants throughout California. So I understand that process.

My question that I have is that there have been other permits, I believe, issued. One that I was involved with was Deep Rose. I don't know if you guys remember that one.

MR. HAGERTY: Yes.

RICHARD CERVANTES: Went up and toured the site on Deep Rose, and I don't think it ever went anywhere. One of the questions that I have that I would like to ask is, are prospective developers required to prove financial responsibility? In other words are they adequately capitalized to do the project of which they want to do? Or can anybody, you know, take out a lease, anybody that can pay the fees to get a lease? So that was one question that I had to ask.

The other question involves the de-aquifering of Rose Valley. It's been -- we've had a lot of controversy on that, and you know, there is water -- whenever you run condensers, you have to have make up water to the condensers because they are

notorious for evaporating water. And so the condensing process, it cools liquid back for reinjection, takes quite a bit of water.

So the aquifer -- can the aquifer support more geothermal plants in that area? So that's a question that I have. That's a technical question that only the geologists and hydrogeologists would be able to answer. I don't know.

So but basically the other question I had is, would it be possible for the Tribe to put in a plant, to obtain a lease and then through a subcontractor put in a geothermal plant? All of the plants that we're talking about are under 50-megawatt plants?

MR. HAGERTY: Yes.

RICHARD CERVANTES: They're all under 50 megawatts? Well, you know, Coso plant is 250 megawatts. You know, that's a big -- one of the biggest plants in the state.

And so, I had another question, too. I wanted to ask, does a developer have to have a buyer of his product before he can go ahead and develop? In other words does he have to have a utility along the line that's going to say, yeah, we'll buy all your capacity? I tried to find that out, but utilities

wouldn't tell me because they said it was privileged information. So they wouldn't tell me what they would pay or if they would buy it or anything about it, you know. It was proprietary information, according to them. So that's another question that you might come up with an answer for at some point in time.

MR. STRAND: Okay.

RICHARD CERVANTES: That's basically what I had. The County of Inyo is very interested in the development of geothermal energy and alternative energy of, you know, photovoltaic and solar towers and all of the new technologies coming out when we have some locations that could possibly be good locations. One is Dry Lake. There is also a possibility of utilizing part of that for solar collecting.

Geothermal, it works night and day. With solar, its location is critical, you know. It can't be in the shadow of the mountains. You've got to have the most solar hours on it that you can. It's very interesting. That's all I have.

MR. STRAND: Do you want to address it specifically, or shall we just --

MR. HAGERTY: I can.

MR. GUM: Sean, why don't you start, so much as we're capable.

MS. CADAVONA: Just so that you guys know -- I'm sorry, I'm Karen Cadavona. I'm just taking quick little notes, along with the court reporter, of topics.

MR. GUM: We're going to try and give you an answer here as best we can.

RICHARD CERVANTES: Some of them.

MR. HAGERTY: And some of the answers I don't know for sure. The capitalization of the company, if a lease is issued, before we will allow the company to go out on the land, we will bond the company. There's a requirement for the performance bond, and that's not the same as insuring that the company is capitalized to cover the project.

What we have done in other areas, especially up north, is that the scientist looking at a performance bond, which may be as minimal as $10,000 for a single lease, we have looked at reclamation bonds where, as the company increases the amount of activity out at the land, a couple of wells or whatever, we'll increase the bond to cover those activities in case the company decides that they no longer are interested and it leaves the public with basically the responsibility to plug and abandon those wells.

So to answer your question specifically, no, we do not address the capitalization. It often is difficult to do that. There's nothing in regulations that require us to basically have a threshold of what a company can or cannot do. But through reclamation bonding, we can require that before they take on a project and move forward, they must have that bonding in place. So I'm not sure if that's what you're looking for.

The offer for the use of the water, I don't have an answer for that. Clearly another project in Rose Valley, there was a lot of discussion that involved utilization of that water. There was a model proposed that will be used to see that the pumping, when it does occur, how that model will react.

Clearly the use of water in geothermal is important. There are situations where air cooling can be utilized. Back in Mammoth in Mono County, the three power plants there actually use air cooling. But air cooling is dependent upon ambient temperature, or ground temperature. If it's too warm, a company can't cool the exhaust of the turbine down low enough, and so it doesn't work. Thermodynamically it just won't work. So while it would be easy to say that air cooling is a possibility, the economics I don't know.

RICHARD CERVANTES: I've looked into the air-cooling part. Air-cooling condenser would work fine for half of the year, and then you could go with a water cool condenser for the other half of the year. It would require the additional expense of another condenser, where you'd have two condensers, one air cooled and one water cooled. Right now, you know, an air cooled would be working fine right now. It would be wonderful.

MR. GUM: Today.

RICHARD CERVANTES: We have below freezing temperatures at Coso and Rose Valley for quite a few months. We have 80-some -- 85 nights below freezing typically in the area. So that's beautiful for air cooling.

MR. HAGERTY: So that's a possibility. That wouldn't be addressed at a project level to determine what is a company proposing and then in terms of alternatives or mitigation what would be required. It might become a fine line as far as what the company can do an how much mitigation can be applied.

It's like I don't have a specific answer for how much water could be withdrawn from Rose Valley, how much more geothermal can support. That's

something I don't know for sure.

Can the Tribe apply for the a lease? Absolutely. The Tribe can nominate lands for geothermal. Certainly the Tribe could actually acquire their own lease. There are special provisions under our regulations that would allow a tribe and another municipality-type entities to acquire a lease, so that is an opportunity.

If the decision is made to lease here for lands that are outside of the three applications that are pending, covering about 4,000, acres the remaining 17,000 acres would be put up for competitive bid. So clearly the tribes could bid on that. But specifically if the tribes were interested in a direct use, where they're utilizing the hot water for heating, actually a direct lease could be issued to the tribe.

I can talk more about that later. I didn't want to go into too much detail because I'm afraid I'm going to confuse myself. But I can talk more about that.

RICHARD CERVANTES: Maybe if you could give us a contact, I work with the Tribe very closely. I'm on the fire safety council, Paiute-Shoshone Tribe, and currently we're working on a project to build a

8dabf72c-92b9-44b6-b3ea-e1e2e3303f9

firebreak completely around the line with --
THE REPORTER: Pardon me.
KATHY GOSS: With stimulus funds.
MR. HAGERTY: I will be the contact. I will gladly give my card, and at your convenience I'll be more than happy to go into details as far as acquiring a lease. But that certainly is something the Tribe could do.
Does a lessee need to have a buyer for the prior development? No, they don't. They don't require that, but usually the company will have a power sales agreement with utility, because that's where the money is going to come from. Without that power purchase agreement, a company will probably have a very difficult time obtaining funding, obtaining a loan from the bank to build a project because, if they can't sell the power, they're not going to make any money.
RICHARD CERVANTES: That's a critical issue. It's my understanding -- and I may be wrong -- that the City of Los Angeles is not interested in purchasing power.
MR. HAGERTY: Perhaps not.
RICHARD CERVANTES: They have their own, and they'll give you credit for any energy that you

generate for your own use, but as far as purchasing bulk power, they're not interested in doing that. PG & E is, and Southern California Edison is. I attended the meetings down in -- where was it? -- Victorville, and they had representatives there, and they were making agreements with various people, Solar One, solar people there.
MR. HAGERTY: All the power being generated at Coso is being sold to the Southern California Edison. All the power being generated up in the Mammoth Lakes area is also being sold to Edison. In fact, a lot of power proposed to be generated in Nevada will also be sold to Southern California Edison. So SCE is quite a purchaser of renewable energy power.
That was it, I think. Was there another question?
RICHARD CERVANTES: The other is just an observation. We had a lieutenant colonel come before the board from Nellis Air Force Base, and they have their complete solar system for the base, and it's a possibility I'm going to meet with the base commander for the Naval Weapons Station at China Lake. It may be going that way, where they want to have the redundancy of alternate energy on our military bases

and especially those that are located in the southwest, where they have available a lot of solar days. So maybe you might want to have their own geothermal plant.
MR. HAGERTY: Part of the proposal at Coso, the Navy One Power Plant, which is made up of three turbines, three 30-megawatt turbines, the first turbine is actually dedicated to the Navy. The power is sold to Southern California Edison, but the agreement between the Navy, the contractor, Terra-Gen and Edison is that, should Edison's power go down, the first turbine there -- it may be one uniform one -- would be directed to go into the base. The base has a requirement of about 27 megawatts. That turbine would more than cover the base.
This is a side note, though. Apparently some time ago when Edison did go down and the relays were supposed to kick in to provide power to the base, something went wrong, and the base went down, too. So anyway, all the best things sometimes don't work out well.
MR. GUM: Part of the withdrawal orders on the Naval Air Warfare Station, as well as Edwards Air Force Base, say that, so much as they can, they are encouraged to become energy independent, supply

their own needs. And that's why you're seeing some of these major solar applications as you're seeing at Nellis. There's also one interior to Edwards Air Force Base at this point.
MR. STRAND: Okay.
RICHARD CERVANTES: It's an exciting time.
MR. STRAND: Kathy, do you want to ask us your question.
KATHY GOSS: Okay. I'm going to say a little bit more than I was going to say because my friend, Sam, here is more knowledgeable on some of these questions. But first of all, I'd like to ask how you notified the public about these meetings, because I just heard about it today and not through public noticing. So I wondered how you made the public aware that you were holding these meetings.
MR. DALTON: Yes. We did it through the news releases, BLM news releases, which went through our entire database that consists of 5,500 names and addresses of public, elected officials, the media, tribal members. It's quite a large database. It's a consistent database that we use for all of our projects. It also was posted in the Federal Register Notice, which was Friday, September the 11th.

KATHY GOSS: Okay. This date was listed in there?

MR. DALTON: Yes.

KATHY GOSS: Thank you. And then I just wondered if you had a formal description of the geothermal resources that are known in the project area that you're considering, what kinds of surveys have been done, what's known about fault lines in that area and questions like that.

MR. HAGERTY: Good question. We don't know much about the area. What's prompting this are the three applications that have been pending since 2002. I do have a copy of what we put together. It's called reasonable foreseeable development scenario. It's our best guess as far as what might happen, what best type of resource might be there and how it might be developed. This is my only copy, but I can send you a copy of it.

Clearly there haven't been any wells drilled in this 22,000-acre area. Our estimates are based upon the Coso field itself. Deep Rose, the applicant on the three applications, has inferred that there's a resource down maybe 12,000 feet, maybe deeper. In talking to the Coso people, the Terra-Gen people, they don't necessarily agree. Whenever you

get a couple of geologists in the room, everybody is going to have their own opinions.

In terms of faults, no, we don't. It's just speculative, because there is no surface resource that's there. There's no mud pots. There's no thermal features of whatever. So because of the Energy Policy Act of 2005, which is directing us to address these applications, we're moving forward. But the answer is specifically no, we don't have any concrete evidence as far as what's at depth.

KATHY GOSS: And how extensively would the environmental impact -- I forget what level of review you're talking about for this, but for the environmental study, whatever it would be, to what extent would there be some assessment of potential consequences along unknown earthquake faults?

MR. HAGERTY: The reasonable foreseeable development scenario in which we addressed up to two 30-megawatt power plants, identify that each plant conceivably would have about 20, 22 wells drilled, 15 production, seven injection. As a result of that study, we would have to consider pretty much at the project stage, though, in terms of faulting in the area, what would happen with injection associated with that vaulting? Would we create additional seismicity?

So that's a very good question, and those types of studies have been done at the Geysers in Northern California.

That is something that's catching a lot of attention right now is, what happens when you take cold water or cooler water and inject it into rock that might be 400 degrees Fahrenheit, much like if you had very hot piece of glass and dropped it in the water, the glass is going to crack. And most likely, when you inject water at a temperature that's lower than rock temperature, the rock is going to fault, or going to crack. How far will it crack depends on the differential in temperature. But it's a very good question.

KATHY GOSS: Am I hearing now that this would not necessarily be part of the Draft EIS? It is something that will come down further down the line if specific projects were going to be implemented?

MR. HAGERTY: If the decision is made to lease the entire area or these applications or some mixture, if the project were to be proposed, that would be a specific issue that would have to be addressed at this time. At this level it's more of a large umbrella. Because we know so little about the resource, it's hard to develop mitigation to protect

what's out there because we don't know what the company might come in for.

We were hoping that with the State section, with the company that still is Deep Rose, they would drill a well in an area and give us some data that we could then work with. So far they've chosen not do that, so we're a little bit blind in this case.

MR. GUM: They have had their approval from the State of California to drill that year for three years, something of that nature, and they still haven't done it. We have issued them a right-of-way for them to access Section 16, as well as a right-of-way for a pipeline to deliver five acre-feet, I think it is, a year of water for their use during the drilling process. And their application was with a total depth of 20,000 feet.

RICHARD CERVANTES: That brings up a good question. Is a 30-megawatt plant economically viable when you're talking for each borehole that they drill $4 million, $4 million a borehole. So you're going to have 20 boreholes. Then that doesn't even build a plant. So, you know, the geothermal plant, Coso's plant, that's a billion-and-a-half-dollar investment.

MR. HAGERTY: That's a very good

8dabf72c-92b9-44b6-b3ea-e1e2e3303f90

question, sir, and that is a question that we don't have an answer for. But you're absolutely right. In fact, I would be -- I think that's a very conservative amount. I would say that, if you're drilling down to, say, 15- to 18,000 feet, I'm saying you're probably looking at closer maybe to $10- or $15 million for the well.

This is a question that we've had on our minds, too. That's why we were hoping that for the State section that they would drill there just to determine -- they have a hypothesis that the resource is down around 18,000 feet. It's as good of a theory as anybody's. And, you know, until you actually drill into something like that, we don't know.

But clearly those wells would be very expensive. And we feel that it's going to take, say, 15 wells for just the production side. Well, let's see. Fifteen times ten is $150 million on your drilling, and that's an awfully expensive amount.

So that's why, in terms of the capitalization, our reclamation bonding would be commensurate with how much money they're going to put into those wells, because we want to make sure -- if a decision is made to lease and a proposal is made to drill, if they decide they don't want to keep the

wells, we want to make sure the wells are plugged properly.

RICHARD CERVANTES: Just off the top of my head, it doesn't sound like it would be economically feasible in that the return on capital investment would be so far out that no one would want to take that big a risk. Usually they want a return of three years. They want a return capital.

MR. HAGERTY: Good point.

MR. STRAND: Thank you, Kathy and Richard.

Steven McLaughlin. Do you have a comment?

MR. MC LAUGHLIN: Yeah.

MR. STRAND: What's your last name?

MR. MC LAUGHLIN: Stephen McLaughlin. I live in Big Pine, and I'm associated with the Bristlecone Chapter of the California Native Plant Society. We were also involved in discussions about Coso Thermal Plant and their recent application to withdraw all of the annual recharge from the Rose Valley to keep their plant going. And we're mostly concerned about the water issues that may be associated with additional geothermal development in this area.

I didn't live here at the time when the

original Coso plants were evaluated, so I don't know if part of their project description was needing 5,000 acre-feet per year at some unspecified date in the future or not. But if that's going to be the case with any of these projects, I think that needs to be spelled out explicitly in the project description. And if a company is going to tell you they're not going to need it, then I think they would be forfeiting the right to future water appropriations.

If you are going to be appropriating water, I think it also needs to be covered in detail in the EIS where is that water going to come from, and what are the impacts of that water withdrawal? And in our opinion that was never adequately done in the case of Coso. When you withdraw these water sources, whether they're surface water or groundwater, you're going to have an impact on wetland habitat.

The hydrological model that you referred to for the Coso thing actually explicitly states that there will be a drawdown that will result in the drying up of Little Lake and possibly that it would be indicated that that could -- that as soon as 14 months there may be a significant drawdown in those monitoring wells to indicate that, over the life of the project, all those wetlands would be very

seriously impacted.

In the case of that project, no surveys were ever done of the wetland areas. We have no idea what is potentially going to be impacted, and I think that needs to be covered very explicitly in any EIS that's on future water development.

And again it's important to remind you that the entire annual recharge for Rose Valley has already been appropriated. County gave it to a Coso operating company. So even for expiration, if you're going to start handing out five acre-feet here, ten acre-feet here, you're just going to accelerate whatever negative impacts could occur down at Little Lake and associated wetlands. We need to know what those impacts are going to be and when they're likely to occur.

MR. GUM: Okay. I'd like to address, so much as I'm capable, your comment. My name is Linn Gum, L-i-n-n. G-u-m is my last name. I'm with BLM. The understanding that you express as to the hydrologic monitoring and mitigation plan for the Coso project is somewhat skewed. When you say that they're taking the entire recharge for the Rose Valley in the 5,000 acre-feet a year, first of all, they weren't authorized to take 5,000 acre-feet; they were authorized to take 3,000 acre-feet. And the recharge that you're referring to, remember, comes from this water model that deals with this hydrologic maintenance and monitoring plan.

The hydrologic model only considered precipitation that falls on Rose Valley that's 4500 feet in elevation and greater. It does not take into account all of the precipitation that falls on Rose Valley at 4500 feet in elevation and less. In the Rose Valley on an annual basis you get about six inches worth of rain; okay? Each acre has a half an acre-foot. I don't know how many hundreds of thousands of acres are totally encompassing the Rose Valley. But none of that water that falls on that portion of the valley was used in the water model to predict how much water may come into the valley or go out of the valley on an annual basis.

That was done for a very specific reason. That was done to make sure that the estimate was a conservative estimate when we considered water that was going to be put into the pipeline to go over to Coso and help recharge that reservoir.

We have data that goes back nearly 30 years that talks about certain conditions within the Rose Valley aquifer. Overall estimates show that there's

as much as five million acre-feet of water within the Rose Valley aquifer. Five thousand acre-feet versus the five million acre-feet that's available, you could do the math. It's minuscule in regards to how much annually actually is being used by that one particular operation.

Now, we also devised within the HMMP certain trigger levels that we would monitor, and we've got a whole series of monitoring wells throughout the valley between where Coso Hay Ranch is all the way down to Little Lake. And true, we identified under worst-case scenario conditions, if we pumped theoretically this amount and we only had this recharge of 4500-feet elevation and above, we could potentially at a certain rate or time hit that trigger mechanism that would say at Little Lake itself there may be noticeable change at the surface level of the lake.

What was determined to be within normal annual range was 10-percent reduction in the surface acres of the lake itself versus what could possibly be taken and not impact the lake significantly. Each of those trigger levels along those monitoring wells all down the valley assure that, if that is ever reached, pumping terminates. And that will make sure that that

cone of depression, as it travels down the valley over the years, will never result in a significant impact to the surface waters that are expressed at Little Lake. So we're not going to dry it up.

Now, right now we also have a program. Over the next two years, as we are monitoring those conditions in the pumpage of that water when it does begin there at Coso Hay Ranch. And we have times all through these next couple years -- and we'll continue to monitor after that -- where we will gather that data and refine, recalibrate and break that model so we get a greater around more accurate picture of what's occurring in the pumpage of that water.

STEVE MC LAUGHLIN: The 3,000 could be increased with 4800 feet.

MR. GUM: It could.

STEVE MC LAUGHLIN: And that is the entire end of the recharge. Granted, the model did not include rainfall in Rose Valley, but it also did not include transportation by plants in Rose Valley.

MR. GUM: It also did not include water that comes up from the subsurface. We believe that there are deeper waters that are contributed. For example, the waters that are present at Little Lake have a total dissolved solid content of about 1100

parts per million. The water that's picked up out of the discharge from Rose Valley to the Indian Wells Valley at the nearest measurement point to Little Lake, once you're into Indian Wells Valley, is only 200 parts per million.

There's clearly some kind of barrier or something that's going on that's keeping some of that recharge or discharge into the Rose Valley, and it's not making its way to the Indian Wells Valley.

So there's a number of factors that were not included in saying how much makeup water actually is coming into that aquifer that supports the Rose Valley on an annual basis. And again, we did that specifically to make it a conservative model. We don't want to damage that resource. We have no desire to.

STEVE MC LAUGHLIN: I hope the model is conservative. I am not a hydrologist, but I've talked to them, and I think that the yield figure of 30 percent that goes into that, isn't that considered to be a rather optimistic parameter? If that's wrong, if it's 20 percent or 10 percent, then those trigger points are going to be reached a lot quicker than 14 months.

MR. GUM: That's why we have monthly

8dabf72c-92b9-44b6-b3ea-e1e2e3303f90

monitoring being done by Inyo County Department of Water.

STEVE MC LAUGHLIN: Well, I'm very hopeful that, if the hydrological mitigation and monitoring plan does show we're reaching the mitigation levels, that it will be implemented, but I disagree when you say it's assured because, as many times as I read through the EIR, I didn't see anything that actually required turning off of pumps.

MR. GUM: If ever we reach a trigger point, the very first option is shut down pumping, the very first thing. It's right in the HMMP.

So anyhow, we're kind of off base here as far as this present project that we're talking about, trying to just determine whether or not we should even lease these grounds. Certainly the water issues that you raise will be addressed within this document.

STEVEN MC LAUGHLIN: That's all we're asking.

MR. GUM: Absolutely.

MR. HAGERTY: In this document also, taking you one step further, again, I don't mean to repeat myself, but I will. If the decision is made to lease -- and that is a decision. We may not lease. But if a decision is made to lease and a project is

proposed, clearly, as you say, sir, if water is being proposed to be consumed, that's going to be a key issue.

MR. GUM: Absolutely.

MR. HAGERTY: And that's where mitigation in terms of maybe other alternative types of cooling may be required. You know, clearly our intent here is -- as Linn is saying, we don't want to damage that aquifer at all. And the model will bear out as far as hopefully what the Hay Ranch pumping will do. So if any company comes along with their lease and says they want to use so many acre-feet, that is going to be something that is going to be very carefully scrutinized --

MR. GUM: Absolutely.

MR. HAGERTY: -- to the point it could reach where we will deny the project because the water balance will not be there.

MR. STRAND: Again the specification will be at that very specific project level, not in this EIS.

STEVE MC LAUGHLIN: Right.

MR. STRAND: Okay. We've gone through the three speaker cards, so if we can now -- oh, you've got one. I'm sorry.

MR. GUM: Sam had one.

MR. STRAND: Okay. One more, and then after this -- we're scheduled to be here until 9:00. So as long as you guys want to hang out, we're happy to mix and mingle and answer questions one on one and grab some coffee or whatever. Sophia.

SOPHIA MERK: Thank you. I notice that the first Federal Register that came out 9-11-09, it has a deadline of this Friday as far as comments go. Considering the fact that you scheduled some meetings after deadline, I was wondering if you had extended the schedule, and is it located in the Federal Register?

MR. STRAND: It is. I'm sorry. It's not in the Federal Register, but we attached it to our information that you received at the door. I mentioned this earlier before you came, but we noticed that that was, you know, obviously not going to make it. We have a meeting after October 16. So we have extended to out November 9th.

SOPHIA MERK: November 9th?

MR. STRAND: That's right. That will be the end of the scoping.

SOPHIA MERK: Are you going to put that in the Federal Register?

MR. STRAND: We talked about that. What we're going to do is make a correction in the Federal Register. It's going to address, actually, the project area boundaries, which was a mistake in the Federal Register, as well. By the time this posting gets into Federal Register, that meeting will already occur, so we're not planning on addressing this specific November 9th date in the Federal Register, just the project area lands.

SOPHIA MERK: Okay. I have a couple more.

MR. STRAND: Okay.

SOPHIA MERK: The links on your Federal Register, they do not work, and I read through -- I tried to write to Mr. Bolton, I guess it was.

MR. GUM: Dalton?

SOPHIA MERK: Dalton.

MR. DALTON: It sounded close enough. I'm not going to volunteer.

SOPHIA MERK: I'm sorry. I sent an e-mail to you. You never responded, sir, so I was wondering, have you corrected that?

MR. DALTON: Well, let me back up. And I apologize. I've been on travel for the last two weeks, so if this is something you sent since then,

8dabf72c-92b9-44b6-b3ea-e1e2e3303f90

then I apologize. To answer your question in regards to the link itself, is that --

SOPHIA MERK: The links. There was three of them listed in the Federal Register. None of the three worked.

MR. DALTON: Well, we need to look into that, then, because that's something that between the district and the field office --

SOPHIA MERK: But I don't understand --

THE REPORTER: Wait. You need to let him finish talking. You're talking over him. Go ahead.

MR. DALTON: I'll try to work with the district office and the field office to correct those links, because we're both trying to take the lead on who's going to be managing this website.

SOPHIA MERK: Okay. I have a couple of more questions. The geology fracturing that is prominent up in the Geysers area -- and they're having earthquakes and whatever -- they haven't really measured everything. But what I was wondering is, instead of doing a mitigation after the fact to the companies, isn't there some way that you can build into this Plan amendment before the fact that it needs to be explored, it needs to be explored by USGS?

MR. HAGERTY: Part of the document here will be to take a look at the seismic activity, seismic history of the area to determine, what is the baseline? How much seismicity has occurred over time? Quite frankly we don't know what would occur by injecting water into this area.

Clearly at Coso there has been fracturing. There has been some seismicity. The thing with the Geysers, though, it is a different reservoir. There has been ongoing seismicity even before geo-development occurring up there. What would occur here, we don't know, but at least we will have a baseline from which to go.

If this resource is down as far as the proponent is claiming it is, at, say, 18,000 feet, just from a professional opinion, I would doubt that we would see much at the surface in terms of seismicity. If most of the seismicity within the Geysers is within, say, 3- to 7,000 feet, if these gentlemen want to drill down 18,000 feet, I don't think there would be much activity at the surface.

I'm just saying at the standpoint of what we know today. We don't know exactly if there's faulting in this area. We do know, of course, there's the Sierra thrust fault that basically allows for the

Eastern Sierras to move. How that might be involved, I don't know.

MR. GUM: We know in that area there's literally thousands of microtremors on an annual basis, things that you and I don't normally detect, you know, Level One and Level Two-type seismic events. And G.S. has been monitoring those for years and years and years, as has, I think, probably the Coso Geothermal Office there.

So we do have some knowledge of it. Major events -- you've lived in the area longer than I have, you know. There's been half a dozen major events since about 1991 or '92 up and down here that measured -- I guess the biggest one was 7.4 down at Landers, and we had a couple near here within that three-mile-deep zone, epicenters on the base that ranged in the five category. I don't think we have had anything over six and lots of them, thousands, in the two, one and less category.

SOPHIA MERK: Okay. Thank you. I have two more questions. I notice that in some of the documents I was able to download and get from the BLM office that the concerns for the Native Americans were going to be addressed, but I have something else that probably needs to be addressed, too, for the Native

Americans, and that's the access for the Native Americans.

I mean, you can say, "Okay. You can go in that area," but without access to that area, they really have a problem. So I would like to see that also addressed in the Plan amendment.

And then the final one is, if this does come in as a Plan amendment, would companies just have to do mitigation instead of a complete EIS?

MR. STRAND: No. In an individual project, once the application is approved, then that individual project would go through its own separate NEPA evaluation.

SOPHIA MERK: Thank you.

MR. STRAND: Scoping meetings, noticing, draft documents, final document, same thing.

MR. HAGERTY: I have a question, then. In terms of access for the Native Americans, are you referring to just this project area, because I know that there's an issue, of course, within the base but --

SOPHIA MERK: There is an issue on the base but for this area.

MR. HAGERTY: I'm not aware that there's any restrictions.

8dabf72c-92b9-44b6-b3ea-e1e2e3303f90

Page 58

MR. GUM: The only restrictions we have in the area is maintaining your vehicular access to existing roads and designated trails through the system. And, as you would know from being in the area, there's not many of them out. There's Coso Gill Station Road and Pumice Mine Road, and then there's a road that goes to McCloud Flats, and that's it.

MR. HAGERTY: Are you asking for additional access?

SOPHIA MERK: No. I was just wondering if those were going to be left open even if this goes.

MR. GUM: Yes, absolutely.

SOPHIA MERK: Thank you.

MR. STRAND: Okay. Well, thank you all for coming. We really appreciate your time. We appreciate your questions and concerns and just patience with the process. Like I said, we'll be here a little while longer, and we'll just hang out. If you want to ask additional questions one on one, we'll be happy to do that.

If you can, there's also comment cards you can fill out and take with you. And you can leave them here with us tonight or mail them in. We'll accept it either way. Thank you guys.

MS. CADAVONA: I just have to clarify,

Page 59

too, for the folks that have the Federal Notices as well as these comment forms. I know everyone said the links weren't working, but I know for sure that the links that I placed right here down below where it says "BLM.gov," it's not a project-specific website. It brings up all the documents and things that the Ridgecrest field office has, so that's where the information is going to be available at. And I know this is a functional link. And they also have for the Haiwee project a project-specific e-mail address. It's also on this little notice.

SOPHIA MERK: But it wasn't in the Federal Register?

MS. CADAVONA: No, it was not in the Federal Register.

SOPHIA MERK: Thank you.

MR. GUM: Thank you very much.

(The proceedings were concluded at 6:58 p.m.)

-OOO-

Page 60

REPORTER'S CERTIFICATE

I, DIANE CARVER MANN, a certified shorthand reporter, do hereby certify that the foregoing pages comprise a full, true and correct transcription of the proceedings had and the testimony taken at the hearing in the hereinbefore-entitled matter of the BLM Scoping Meeting for the Haiwee Geothermal Project.

Dated this 21st day of November 2009, at Chino, California.

DIANE CARVER MANN, CSR NO. 6008

A

B

GILLESPIE

REPORTING SERVICES

Certified Copy
Haiwee Geothermal Project

October 15, 2009

Bureau of Land Management Scoping Meeting - Ridgecrest, CA

Printed on: November 22, 2009

Job #: 68509DM

Gillespie Reporting & Document Management Inc.
Phone: (951) 682-5686
Fax: (951) 682-4990
Email: grdm@charterinternet.com
Internet: www.grdm.net

CD TEXT FILE & PDF ENCLOSED

BUREAU OF LAND MANAGEMENT

SCOPING MEETING

HAIWEE GEOTHERMAL PROJECT

REPORTER'S TRANSCRIPT OF PROCEEDINGS

LOCATION:	Ridgecrest Parks and Recreation Dept. Pinnacle Room 100 West California Avenue Ridgecrest, CA 93555
DATE AND TIME:	Thursday, October 15, 2009 5:44 p.m. to 7:02 p.m.
REPORTED BY:	DIANE CARVER MANN, CSR CSR NO. 6008
JOB NO.:	68509DM

fb1609b7-d0c5-40c2-a4d9-7191c0357e79

APPEARANCES

LINN GUM - Lands and Minerals Branch Chief
JOHN DALTON - Planning and Environmental Coordinator
SEAN HAGERTY - Geothermal Expert
MIKE STRAND - Project Manager, Power Engineers
KAREN CADAVONA - Public Involvement Coordinator

RIDGECREST, CA THURSDAY, OCTOBER 15, 2009

PROCEEDINGS

-0O0-

MR. GUM: Good evening. I feel like I'm one of those guys in the radio that's talking into the echo chamber. We anticipated having a few more folks here tonight, but since we don't, let's proceed.

My name is Linn Gum. I'm with the Bureau of Land Management here in Ridgecrest, California. I'm a supervisory geologist. Specifially I'm the branch chief of Lands and Minerals and an assistant field manager. The reason we're asking folks to come into the scoping meeting is that we have a Bureau of Land Management proposal to consider some acres up by the Coso area for leasing for geothermal exploration and development.

And with that, I'd like to introduce you to who's here with me to bring this presentation and answer your questions. First we have John Dalton. He is from the Moreno Valley office of the California Desert District. He's a planning environmental coordinator, and he's our project coordinator for this

project. Next to him is Sean Hagerty. He's the geothermal program lead out of our Sacramento BLM State office. And the gentleman at the end is Mike Strand. Mike is with our third-party contractor, Power Engineers, and he is the program engineer that will assist us in developing this EIS. And last but certainly not least is Karen Cadavona. She's the lady in the rear who is the public information specialist with Power Engineers that helps us pull all this together.

With that, I'd like to turn this over to Mike.

MR. STRAND: So tonight, just to give you an idea of what we're going to be going through here, Sean is going to get up and go through a number of slides. He's going to be discussing geothermal resource, geothermal energy power plants just in general touching on what it is that we're looking at as far as an energy source. Then he's going to touch on a little bit about the project itself, a little bit of history, why we're here, why we're looking at this area for geothermal resourcing, and then I'll get up and talk a little bit more about the NEPA process and the scoping process that we're conducting right now.

So if you can, you guys, you could have

grabbed one of these when you walked in, a speaker card. I'm going to ask you guys to just fill that out while we're giving this presentation.

This presentation is going to last about 15, 20 minutes. When we're done with this, I'll collect these cards, and I'll just call you up randomly. You can just stand up at your seat -- there's not a lot of us here tonight -- and just ask your question, give us your comment.

And, you know, like I said, I'm not going to keep you guys to a time limit by any means, but we'd like to get through it so everyone has a chance to speak. If we get to the end of the speaker cards, I'll ask if anyone has questions or comments. And we're free to stay as long as we need to to answer questions tonight.

One thing I would ask is that, if you can stand up, if you can address the court reporter we have tonight, state your name, speak clearly and slowly so she could get everything down verbatim for your comment and then our responses to your comment as appropriate.

Okay. Thanks, you guys. Does anybody need a speaker card right now before we get started, anyone? Can you give him one.

fb1609b7-d0c5-40c2-a4d9-7191c0357e79

MS. CADAVONA: Oh, yeah. Right here.

MR. STRAND: I've got him one.

MR. HAGERTY: Well, good evening. My name is Sean Hagerty. I'm the geothermal program lead in the BLM California State office in Sacramento. My position basically oversees the leasing and utilization of geothermal resources within the state on Federal Lands. So they have my card as saying I'm a geothermal expert. I'm far from that. I've been in the program for 29 years, but there's still -- a little higher?

AUDIENCE MEMBER: Can't hear you back here.

MR. HAGERTY: Let me speak up a little. I've been in the program for 29 years, and I started out in the El Centro office down in Imperial Valley. There was quite a bit of activity down there back in the early '80s and even more activity right now. So I have some background, but clearly I don't know it all, and if there are questions that come up tonight that I don't know, I'll quite frankly say I don't know, but I'll do my best to find out the answers for you.

What I'm going to do tonight is talk basically just very briefly over, what is geothermal? What is the resource? How do we find it? What do we

do with it when we do find it and then the laws that are involved with what applies to the leasing, what applies to the utilization of that resource. So it's all going to be real brief.

I'm not going to go into a lot of detail about the reservoir, so there's some experts in this room who will kind of smile because I'm just going to talk about cartoons and things like that. But I'll be here after the meeting, and if you have any questions that you'd like to ask me of detail, I'm more than happy to at least address those questions. Again I might not know the answer, but I can get that answer for you.

Let's start out with geothermal energy. What is geothermal energy? We talk about the heat of the earth, hot rock, hot rock at depth, how far down? Maybe 5,000 feet, maybe 10,000 feet, maybe even deeper. It's a combination of both having hot rock and then water in that rock, because it's the water in the rock that actually conveys the energy to the surface.

And when we see the hot water coming to the surface, we normally call it, like, a fumarole or a geyser or mud pot or something you'd see at Yellowstone or some other places, hot springs on the

Sierras. So anyway, that's a normal way of convecting that energy to the surface.

The other way to get it is to drill for it, taking a -- not a water well drilling operation because that's too small. You're drilling down to well below a thousand feet, maybe 5,000 feet. So drilling rigs will take you down maybe a mile down into the ground. That's a big piece of equipment. But by drilling down into the earth, you can access where the hot rock is and hopefully where the water is too.

And again, by pulling that water up, the purpose, at least for what we see here in this project, is to produce electricity. The hot water can be used for other resources too: drying vegetables, raising fish. It's real popular in the Imperial Valley, raising tilapia. But for the resources up here, most likely it will be quite hot and more amenable towards producing electricity.

Benefits of geothermal. There's quite a few. It's a clean energy source. Basically there's no gases that come out of it. There is usually some carbon dioxide that comes up with the water but a very small percentage compared to, say, natural gas or coal or some other fuel source. It's reliable source of

energy. It's a source of energy that, unlike, say, solar and wind that's cyclic -- the solar works great when the sun is shining, and the wind power is great when the wind is blowing, but when the sun sets and the wind stops, that energy source stops as well. Now, that's not to say there's anything wrong with that energy source. It's just that it's a source that is cyclic.

Geothermal energy is a type of energy that basically, once you turn the power plant on, it stays on, and it produces energy throughout the life of the project. It does shut down for maintenance, things like that, but overall you turn it on, and it runs at 30 megawatts or whatever, and it stays on.

Geothermal power that is accessible locally. I mean, here's an energy source that we don't have to go overseas to find, we don't have to go outside of our country to find, in fact, we're hoping in this case that we don't even have to go outside of the county to find. And there already is a project nearby, Coso project, that is already producing geothermal energy, so it's likely that there's energy nearby in this project area as well.

Sustainable. Well, what is sustainable? If a resource is found, can it be produced for a long time? In most cases, yes. The heat of the rock will stay with the rock for a long, long --

AUDIENCE MEMBER: Sorry. You're being overridden by the gym class next door.

MR. HAGERTY: I want to make sure you can hear.

MR. STRAND: Do you want to use the microphone?

MR. HAGERTY: Yeah. Let me use the microphone.

Is this better?

AUDIENCE MEMBER: That's better. We can hear you.

MR. HAGERTY: Okay. I don't want to blow anybody out here. Let me use this, then.

So what we're talking about is sustained resource, a resource that can go on for a period of time. I will use again an example of the Geysers of Northern California about 70 miles north of the city of San Francisco. Their production has gone on for almost 40 years, and the temperature of the rock, the actual reservoir rock that they're extracting the water from, has only changed a few degrees. It's about 475 degrees Farenheit, and the temperature has only dropped a few degrees. So with sustainable, the

rock will still be hot.

Now, if you're pulling water from the resource and not injecting enough back in, that's another issue and certainly something that would need to be discussed. But as far as the heat source, the heat source is something that will be there for a long, long time. How long depends on how quickly we're extracting energy, but normally we're looking well in excess of 30 years, so a long, long process.

Okay. So in terms of energy development, what actually occurs? If we actually decide to lease, if a decision is made that we will lease a portion of this land or all of the land, what's going to happen on there? Well, we've developed a reasonable foreseeable development scenario based upon the best information we have right now. There's no wells that are in the area right now, so we don't know exactly what is the temperature of the resource, if it doesn't even exist.

We have some applications that have been applied back in 2002 that the applicants feel that there is a resource, and so that's the driving force. And I'll get into more of that a little bit later as far as the purpose and need.

But the issue being is that, if the leases

are issued and the company wants to access that resource and drill for it, what will first happen is that they'll drill at least one well. They'll drill it out there to determine, what is the depth of the resource?

Okay. So if they do discover a resource at depth and they produce it up and it turns out to be commercial -- in other words, there's enough fluid that comes up through the well and enough heat to warrant building a power plant -- then we've got a couple of different things that can go on.

Clearly, if the decision is made to lease and then a proposal is made to drill the resource, the drilling of that resource will also require another environmental review. The environmental review that we're going through right now is just to make the decision basically to lease or not to lease. Once that decision is made and if a decision is made to lease, then subsequent operations on that lease will also undergo a separate environmental review.

And that's important to remember because there's a lot of issues out there. Clearly water is one of them. Cultural resources is another. Visual is a whole slew of issues that will come into play. But for this demonstration for this example, let me

just say that we're moving on. They've drilled a well. They've found a resource. Now what are they going to do? Well, most likely they'll come in with a proposal to build a power plant.

Okay. With that power plant they'll also say how many wells they'll need to sustain the power plant. There will be production wells and injection wells. Also there will need to be access roads to get into where the power plant is going to be built, as well as where the wells are going to go.

There will be transmission lines because you need to get the power out of the area to sell it to a utility, and that's basically where they're going to make money, is selling that electricity. And then finally, as I said, there's utilization. That's where they turn the power plant on and it's now producing.

So we have identification of the resource by drilling down to the hot water and rock. We have a proposal coming in to build a power plant. I'll get into more detail on that but kind of conceptual. Then we have exploration, drilling, development and then, finally, utilization.

This is just a little cartoon, very, very simple as far as what we might expect in a perfect world as far as geothermal resource. Let me get over

fb1609b7-d0c5-40c2-a4d9-7191c0357e79

here. There's supposed to be a pointer on this thing. Oh, it's still here. Okay.

At the bottom here we've got a hot rock heat source. Those could be magma, could be liquid rock. Probably it's not liquid, but it's a very, very high-temperature rock. That rock is conveying heat upwards as it cools off. It's coming into this area here, where it's full of fractures.

In most situations we've got fractures that are coming in from the surface as well. We've got rainwater that percolates down into the fracture, hot rock on both sides here. Again this is a cartoon. This isn't how it really works, but it's close enough for this presentation.

Once the water is in the rock here, of course, as it gets hotter, it gets lighter, and it will normally come to the surface as a hot springs, a fumarole, a geyser. But in most cases there's some sort of restriction, some sort of barrier rock or cap rock. In most reservoirs because of the chemicals in the water -- like calcium carbonate, iron, other things -- the fractures that have allowed the water to come into the reservoir in the first place often get plugged up, just like your plumbing in the house. If you have well water, if you have to replace a pipe, I

mean, you'll find that there's some deposits that are in the pipe -- not necessarily bad, but it will eventually clog the pipe.

Okay. So in this case these cracks will normally see a level -- and then this darker material rock will become what we call a cap rock, sealing in the hot water, so it's like a steam kettle with a cap on, and the heat continues to come up and heat that water up.

What was I talking about earlier about exploration? Then what a company will do is that they'll drill down into that hot rock, accessing the hot water. The hot water will be brought to the surface. This type of power plant is called a binary plant.

I'll get into the different types of power plants, but for this purpose the water is brought up to the surface. It goes through a heat exchange, much like the radiator in your car. The water goes through the radiator, and there's another working fluid that picks up the heat. It's an isobutane or some other fluid that absorbs the heat, turns into a vapor, which turns the turbine, which turns the generator and turns it into electricity.

In this case the water is never allowed to

reach the atmosphere and never goes out in the open. I doesn't flash. It's cooled down because energy is taken out of it, and then they inject the water back into the reservoir but not necessarily the same depth. But it's important to inject the water back in there because they want to maintain reservoir pressure.

This is a quick schematic, and after this meeting if you have a question as to how this action works or geology issues, I will be more than happy to talk about them.

Okay. In this last part, you may have heard talk about a binary power plant. Well, there's three different types of power plants that we find. Any one of them could be used, depending on the type of resource that we find. The first one is, as I mentioned, that we've got a binary power plant. Binary means two, two fluids, binary, two. You've got the fluid that comes up from the rock. It's hot. They send that fluid through a heat exchanger, which absorbs the heat, and that heat is conveyed to another working fluid -- again, isobutanes, et cetera, propane and that sort of thing. That's what boils, turns into a vapor, turns the turbine, turns the generator, produces electricity. Then the water is ejected.

The second type that is commonly used is a

flash plant. The difference between a flash plant and a binary plant is that the primary issue here is that for the flash plant the water normally that comes up out of the well is over 330 degrees Fahrenheit. Now, you'd say, well, gee, why isn't it boiling? Well, the reason it isn't boiling is -- and you don't really want it boiling -- is because it's under pressure.

I used this example the last couple of nights, but think of an old-time pressure cooker, the kind my mom used to use. You cook vegetables in there, and the reason why it cooks faster is because, as the pressure increases in the pressure cooker, the boiling temperature of that water increases, as well. That's why pressure cookers are very dangerous, because, should a child open the pressure cooker while it's still cooking, much like taking a soda can and shaking it and popping it open and taking the cap off, suddenly you release that pressure, and the boiling point drops immediately. Well, if the water is at 250 degrees Farenheit and somebody is taking that top off, now you have got water that's been boiling immediately scalding. So you don't see pressure cookers anymore.

Same here in the flash plant. They want it to have it. They bring the water up, send it into a large vessel that's at atmospheric pressure. Then it

fb1609b7-d0c5-40c2-a4d9-7191c0357e79

boils into flashes of steam. The steam then turns the turbine, which turns the generator, which creates electricity.

So I kind repeat myself in terms of this turbine-generated electricity, but you see, it's just an energy source that's turning something that's producing electricity. It's the same in a coal plant, same in a nuclear power plant, just a different energy source that's turning that generator.

Finally a dry steam plant. These are not common. Luckily in California we're blessed to have one resource north of San Francisco called the Geysers, where we actually find dry heat. In most of the reservoirs throughout California and throughout the West, when you drill into the rock, you go down a mile or so, what you find is actually hot water, very, very hot water, 400, 500 degrees, 650 degrees Farenheit.

In the Geysers what they find is, it's just dry steam. Geologists believe that there still is a pool of water boiling way down in depth 13-, 15-, maybe 18,000 feet down. But so far they haven't found it. It's just dry steam, which makes it perfect because you don't have to convert it through anything. You don't have to send it through a big pot to get a

flash. It already has a flash. So the only thing you need to do is, basically it turns the turbine that turns the generator that produces electricity.

And those plants with the Geysers are fairly good sized, somewhere upwards of 130 megawatts in size, so they're pretty good. But unfortunately there's only a few places in the world where there's a real commercial resource like that. One is at the Geysers. One is in Italy about 50 miles to the north, northwest of Rome.

So when we talk about leasing of Federal Lands, we consider the leasing action, this issue to lease or not to lease, to be a major Federal action on our part. Therefore, since it is a major Federal action, then that National Environmental Policy, NEPA, comes into play, and that's what this whole process is about, basically taking that action, the action of deciding to lease or not to lease, and analyzing it, analyzing it for what could happen if we lease. And it's a Federal action, so under NEPA we have to address it.

The specific regulations that deal with geothermal are Title 43 Code of Federal Regulations, Part 3200. I do have copies of the regulations back on the table. I also have a website that should work.

So if you have access to a computer, you're more than welcome to take the full booklet of regulations. But if you don't want to have all that paper and want to save some paper, then the website will give you access to where those regulations are.

If a decision is made to lease and a lease is issued, then the lease conveys the right to drill for, explore, utilize the resource. But it doesn't convey the right that they can go out there right away. As I mentioned earlier, if they're going to do some exploration, that exploration is also going to have to undergo a NEPA review. If through that exploration they determine there is a commercial resource, then they come back in with a proposal for a power plant and the power plant will also undergo another NEPA review. So we're conveying the right to access the resource but not until the necessary NEPA review has been completed.

Here's just kind of a laundry list of some of the laws that are coming into play and will be addressed in this document. I already mentioned the National Environmental Policy Act of 1969. That's the document that triggers off our responsibility in terms of this document.

Also other factors that will come into play

that will add to and supplement NEPA. One is the National Historic Preservation Act of 1966, addressing issues associated with cultural resources, Native American issues, a wide variety of issues here.

We also have the Endangered Species Act of 1973. What species are out there? Are they sensitive? Are they threatened? Are they in danger? Under this act we can find that out, and if this decision is made to lease, what could be the impact on those animals?

We have a couple of Energy Policy Acts that are involved here too, two under different administrations. Under the Bush administration we have got the Policy Act of 2001, which basically is encouraging the utilization of renewable energy, so it talked about gas and a lot about that, but it also encouraged the Federal government to pursue and allow access to Federal Lands for renewable energy.

The second Energy Policy Act of 2005 -- this is under the current administration, and it gave us greater incentive, basically. It said that by 2010 that the backlog of geothermal lease applications must be reduced by 90 percent. That's across the board through all Western United States. So part of the issue here, part of the driving force, is that in the study area we have three pending lease applications, and they're part of the backlog, and so our issue here is to address that backlog. I'll get into that a little bit more, but that's an important issue.

And, of course, lastly, the Geothermal Steam Act of 1970. That is the act that gives the authority to the Department of the Interior and to the Bureau of Land Management to issue geothermal leases in the first place. Some of you will say, well, why can't the Forest Service issue leases, or why can't another agency issue leases? Because only the Department of Interior under this NEPA act is authorized to issue leases.

Let me go back. Okay. One of the more important issues here is -- of course, this is all under the umbrella of the California Desert Conservation Plan. I need to talk about that. And also one act that's not on here, but some astute person the other night brought it up, the Federal Land Policy Management Act of 1976, which talks about coordination. That talks about addressing public lands and ensuring that resources are being used. So that's not on that list, but it's important.

Let's get specific. Let's get down to the brass facts, or let's boil this down here a little

bit, if I can use a little bit of a pun here. We're talking about the Haiwee Geothermal Lease Area. It covers about 24,000 acres, of which about 22,000 acres are public lands.

Let me stand right here so you can see. These might be easier to take a look at a little later on. It's too hard to see right now. But in essence we've got a little over 22,000 acres of Federal Lands, of which about 4,000 are currently encumbered by three geothermal lease applications. We have also have 640 acres, or a section, of State land. And that land is actually already leased through the State Lands Commission. And we also have about 1200 acres of private land, mostly in Rose Valley itself.

So for the private land we have no jurisdiction over, and on the State lands we have no jurisdiction over. The only thing that this document is going to address are the 22,000 acres, roughly, of Federal Lands, and that's where this comes into play under the Geothermal Steam Act. As I mentioned, pre-pending applications, about 4,400 acres have been pending out there since 2000.

Project area map. We've got two maps up here. This is kind of an aerial-type map for locations. Let me bring your attention to where I'm

pointing here. For those who are familiar with Coso Junction off of Highway 395, Coso Junction is approximately in this area right here. So the Little Lake riparian area is to the south just off the map. The South Highway Reservoir shows up here. 395 is running pretty much north-south, and then you have several transmission lines that are cutting across the area too. So the darker area to my right here, that's the China Lake Naval Weapons Center. You can see there's pretty much a boundary on the southeast side. There's a buffering here.

Purpose and need for the project. Again one of the key issues here is to determine whether to approve geothermal leases or not, whether we're going to have the land open to geothermal leasing or not. That's the critical issue because, later on, if we do decide to lease and a project is being proposed, then there will be other decisions: Should we approve the project? Should we modify it? Should we deny it? So that's a whole other set of issues with a lot of detail further down the road.

The other issue is basically two issues when it comes to leasing. Should we offer the three pending leasing applications? Should those be leased? Should we consider the other 18,000 acres out here for

leasing or maybe a mix of someplace in between? Maybe instead of 18,000 acres, maybe we should consider 10,000, maybe more, maybe less. So I'm just trying to get you to think that there's alternatives that will be coming into play here, and those alternatives will be based on issues coming up from this meeting as well as from the draft document.

We've got the California Desert Conservation Plan that this is a Plan amendment. So this document will amend the California Desert Plan, and that's important. There's been a lot of amendments to the Plan since 1980, and so this is an amendment going way back to the initial Plan back in 1980.

Again, the consideration of leasing here, two presidents' energy plans of 2001 and 2005. Then finally, if a decision is made to lease, then the issue here is that we're leasing. We're helping the State of California hopefully reach its renewable energy portfolio goal for 2010. It's currently at 20 percent. The Governor has said something over the last couple of years where in 2020 it's supposed to be bumped to 30 percent. So with renewable energy coming from this area, if we decide to lease and if a resource is found, it will go toward that goal.

fb1609b7-d0c5-40c2-a4d9-7191c0357e79

I'm going to at this point turn it over to Mike, and again I'll be here for the rest of the evening. If you have any questions about geology, about leasing, I'd be more than happy to talk to you. With that, I'll give it to Mike.

MR. STRAND: Thanks, Sean.

AUDIENCE MEMBER: Do you have a volume knob on your microphone? We're competing with the dance.

MR. STRAND: I don't see a volume on here. Is it okay? Can you hear me?

AUDIENCE MEMBER: A little better, yeah.

MR. STRAND: Okay. Well, Sean has already really gone through everything that we need to know at this point. Let me just touch on a couple of items here. Then we'll open it up to comment and questions. He talked about the proposed action, and that is to amend the California Desert Plan. And again that's a decision that's either to lease or not to lease this project area over to geothermal resources.

One of the alternatives to that is a no action. Under the no action, there would be no Plan amendment and the lands within the project area will remain the same, will be managed the same as they are

right now within the current Plan. There will be no Plan amendment.

Other alternatives that we have, like Sean mentioned, is a combination of approving those applications that we already have plus some combination of the 22,000 acres. And we're here for scoping. We're here to hear your guys' comments, and through the scoping process there may be additional alternatives that could be developed.

NEPA scoping. That's what we're doing right now. NEPA requires scoping. We're conducting these scoping meetings. We're collecting your comments here tonight, and you can also fill out the form. You can mail it in to us. There's an e-mail address. You can send comments in through e-mail, so there's lots of ways to participate in scoping.

As far as the project timeline is concerned for developing the EIS, we're right here in this October section here of scoping. The Draft Environmental Impact Statement and Draft Plan Amendment will be completed this winter, early winter, 2010. And then once that's out and completed, it will go out to the public for review. It will be on the websites. There will be notices out to where you can view that, where you can get copies of it if you need

a copy of it. You can review that. There will be a public review period. You can submit comments on the draft, and during that time period we'll also conduct some public meetings.

Once we're through that, the Final EIS -- the bulk of the Final EIS is really just your comments and the responses from the Agency regarding your comments. There may also be changes or clarifications in the draft itself. That will all be published as a Final EIS, and that Final EIS will then go to the BLM decision makers. They will make a decision on the project, and that's when we'll issue the Record of Decision, what we commonly refer to as a ROD. And if there's a Plan Amendment, then that will be the Final Plan Amendment with that ROD.

Again I just appreciate you being part of the process. I appreciate you guys being here tonight. Let me mention one thing. The Notice of Intent had a date for scoping to be completed by October 16th. That's tomorrow. That's not going to happen, so we're extending that out to November 9th. So we encourage you guys to have your comments in to us by November 9th so it can be clear in the EIS.

However scoping is an open process throughout the development of the EIS, so we will take

your comments past November 9th, as well, but at some point there will be a cutoff because we've got to get the thing printed and put out to you guys for review. So we just encourage you guys to get it in as soon as possible, your scoping comments.

So again thank you guys for being here, and if you guys could just hand me your speaker cards, then I'll collect those, and we'll continue. I think I'll hand you guys another microphone. That way the court reporter can hear us.

MS. CADAVONA: Hello. The first one, Chris Ellis.

CHRIS ELLIS: Good evening. I just had a question, and I know we're early in the process. And this is related to a decision whether or not you're going to lease. My question is probably a little bit further down the road. How does a decision to lease and ultimately make a decision to produce or attempt to produce or explore for geothermal power -- how is the BLM going to make decisions relative to groundwater usage? And do these leases include a provision for groundwater associated with potential drilling and then potential future recharge if a geothermal reservoir is found?

MR. HAGERTY: Yeah. Good question,

Chris. And this came up actually in the first meeting we had in Lone Pine.

The decision here, besides the Plan Amendment, is just to decide to lease or not to lease. In terms of the water budget for the Rose Valley and getting into the issues there, while this document will talk about the need for addressing water, it will talk about the model that was developed for the Hay Ranch pipeline. We're not going to get into an issue of how much water could be used or may be used or whatever until after that decision to lease is made.

At that point the project comes in to drill, and they plan to use -- let's say they need to use an acre foot of water for the drilling. It will be at that point that we'll address, where is the water going to come from? Are we planning to take from Rose Valley or someplace else? If it's coming from Rose Valley, then these are the consequences.

If we take it a step further, if we find it's a commercial resource, then the same thing will apply with even more scrutiny. Obviously a lot of issues, a lot of concerns. So we want to make sure they're addressed, but at this level it's too premature because there's a variety of issues that come into play.

Dry cooling can be a factor. Will it be a flash plant, a binary plant? Will they find water someplace else? There's a multiple of issues we could address, but we'll be shooting in the dark. So all we're going to address at this point is the decision to lease or not to lease.

But clearly the applicants that already have their hands in the fire, they know water is going to be a big issue.

MR. STRAND: Dan Burnett.

DAN BURNETT: Yeah. Actually I don't have any comment.

MR. STRAND: Okay. Tom Budlong.

TOM BUDLONG: Yeah. I don't have any comments. I have questions. Mike, can you explain who you are and where you're from. I'm confused.

MR. STRAND: Absolutely. Good question. I had it last night too. Why are we here? Someone asked me last night. I'm with Power Engineers. I'm an environmental project manager with Power Engineers, working in the Environmental Division, and we've been hired by the BLM to assist them in developing and writing this Environmental Impact Statement, so we're working as an extension of the BLM staff.

TOM BUDLONG: Okay. Thanks. If you

actually get together on making a plant, what's the typical life of a plant like this?

MR. HAGERTY: Normally, sir, they would be built with the expectation of producing at least for 30 years. That's in terms of financing. But normally the plant would probably go a long way, way beyond 30 years. Some of the projects I talked about -- the Geysers, for example -- some of the operations up there have gone beyond 30 years. So it's more of an issue of the resource. What is the life of the resource?

Management can go way beyond 30 years, but in terms of mechanical issues, the plant will keep running. But just like your house, where you get a loan for 30 years, these power plants normally have a loan for 30 years. So after it's all paid off, it's all written off, but there's no reason to shut them down. They will continue. With the resources there, they'll continue.

TOM BUDLONG: The resource is basically infinite; it could be on forever?

MR. HAGERTY: It could. There's factors that become involved. If you're actually expecting energy faster than it's being replaced within the rocks, you may cool the rocks down. Also the water

issue we touched on, if you pulled out too much water, it's the water that's sustaining the energy from the hot rock to the surface. So you want to make sure you're not extracting the water and basically taking it out so that you're not drying the reservoir. But that's another series of issues as well.

TOM BUDLONG: Somebody said there was an applicant in 2002?

MR. HAGERTY: Yes, sir.

TOM BUDLONG: Who was that, and is that applicant still around?

MR. HAGERTY: The applicant is still around. There was three applications for leasing that were filed, I think, back in February of 2002. Mr. Metcalf, or Terry Metcalf, is one of the individuals. He's associated with a group called Deep Rose, and I was kind of hoping that somebody from Deep Rose would be here tonight. However I don't think he is. I don't think there's anybody in the audience from Deep Rose, but they are still around, yes.

TOM BUDLONG: And all three are Metcalf, are they?

MR. HAGERTY: They are associated with Mr. Metcalf. They co-owned the group with the name of Deep Rose, but Mr. Metcalf actually has one of the

fb1609b7-d0c5-40c2-a4d9-7191c0357e79

Page 34

leases under his name, and the other two lease applications are under Maxx, M-a-x-x, Incorporated, but I believe they're all associated under a Deep Rose group.

TOM BUDLONG: How deep do you think the initial well will go? We talked about Deep Rose before, and they were talking about going down a long ways.

MR. HAGERTY: Yes, sir. They have told us that they believe the resource is down somewhere approximately 15- to 18,000 feet down. In my own opinion, I mean, that's a tremendous amount of depth. That's a tremendous amount of cost. All I could say is that it will be a very costly endeavor to go that far down.

TOM BUDLONG: And that's what you're talking about with this initial process that, before you decide whether to amend the Plan or not, is going down that deep?

MR. HAGERTY: If the decision is made to lease, if we issue the leases, that will be up to the lessee to come forward with a project to explore. If they do plan to drill at that depth, we'll scrutinize it as far as casing and types of metals, surface area, things like that. But it will be very costly on their

Page 35

part to drill at that depth if that is the target.

TOM BUDLONG: I've heard rumors that there are a lot of cultural resources in this area. Anything about that?

MR. HAGERTY: I'm going to defer to Linn Gum on this one.

MR. GUM: There are a lot of cultural resources in this area.

TOM BUDLONG: Answered that question. The answer was "yes." You could have just said "yes."

MR. GUM: Yes.

TOM BUDLONG: Yeah. Why 20,000 acres instead of just the initial part that the three lease applications? Why such a big area?

MR. DALTON: The reason for this is that we're going to process these three applications. If indeed we do process these three applications, we may get requests for additional with the competitive lease applications, so we decided to include the 22,000 acres potentially for geothermal development.

TOM BUDLONG: Do you think other applicants could show up and want to get the same area?

MR. HAGERTY: Just to kind of go a little bit further than what John said, when these

Page 36

applications were filed back in 2002, the current regulations at that time said that for areas that are outside of a known geothermal resource area, or KGRA, there is a KGRA area called Coso KGRA. You could apply for lands outside of the KGRA without applications, and that's what these gentlemen did here with the three applications. They couldn't apply for lands inside the KGRA because that's competitive. So while they were much very much interested in applying and they did get a lease, Section 16 -- they did get a lease from the State Lands Commission. We felt that instead of piecemealing this, instead of addressing the three applications, since they were interested beyond the KGRA, we felt would be good to at least address the larger area of the 18,000 acres beyond the 4,000 acres here.

As it is right now under the 2005 recommendation, all this will now be leased competitive. We have done away with the issue of KGRA. We no longer have non-competitive applications. Much like our boiling gas program, all of the lands now have become competitive, so if somebody were to nominate the land even outside of our boundary area, then we now all become competitive.

TOM BUDLONG: Thanks. Let's see. You

Page 37

talked about the 640 State is already leased to Deep Rose?

MR. HAGERTY: Yes, sir.

TOM BUDLONG: All right. That's all I have right now.

MR. HAGERTY: We're doing great.

MR. STRAND: Sophia -- Sophia Merk.

SOPHIA MERK: My name is Sophia Merk, NPL News. Thank you. In the 1872, a little while ago, we had a 7.4 earthquake in Lone Pine, California, which is not that far up the road from Deep Rose, this area. What I was wondering about, there's been recent reports on increased seismic activities in Europe and Northern California. Some say it is the result of fracturing geothermal development projects.

And I will follow up further with a letter, but I was wondering if -- would you seriously consider analyzing this issue in this part, not after the 90 days when we go into the other part, but during this part, if you will really look at the fracturing at this point.

And I was also wondering, you say that you're going to have other alternatives in this part, but I haven't seen anything in writing so far. And it's just verbatim. And since I know that things are flying pretty fast and things have changed since the first meeting, I know now that you've incorporated other public -- other scoping meetings with the Timbisha, and I just wonder if maybe you shouldn't start with another Federal Register Notice and put it out there for the full 90-day review.

Since this is a land use, it's going to be an amendment. It's not just an EIS. It's an amendment. So I was wondering if you could really seriously look at the fracturing part of this.

I also was wondering, there's some land that's being designated under WEMO for disposal. Is any of this in that area, Linn?

MR. GUM: Yeah. The lands that were under WEMO that were just entered for disposal were at the northern end of Haiwee not subject to this area.

SOPHIA MERK: Thank you. I wasn't sure exactly where it was. It wasn't real close.

MR. GUM: Up by the North Haiwee Dam in the section that is immediately adjacent to it, is where that land is.

SOPHIA MERK: Okay. And I just have one more thing that I would like to add to my comments, and that is, what other tribes have you contacted besides the Timbisha?

MR. GUM: I'd like to call Don Storm. He's our archeologist, and he can talk about exactly which tribes will be contacted.

MS. MERK: Thank you.

MR. STORM: Thank you. I'm Don Storm, archeologist for BLM in Ridgecrest. And last week I sent out five formal private consultation letters to Timbisha Shoshone Tribe in Death Valley, for one. Four tribes in Owens Valley were in this: Lone Pine, Fort Independence, Paiute Tribe -- Big Pine Paiute Tribe and the Bishop Paiute Tribe. And there are still advisory letters that I'm going to be sending out to several of the federally unrecognized tribes in Kern County, Lake Isabella and Tehachapi probably next week regarding this.

The formal consultation went to the five recognized tribes, and we'll be following with other communications and correspondence letters to other Federally unrecognized Indian communities in Kern County.

SOPHIA MERK: Have you scheduled formal meetings with those tribes?

MR. STORM: Next Tuesday, the Timbisha, next Tuesday. That was scheduled not by me, but that's one of the four scoping meetings, and if other

tribes would like to have a presentation about the project, we will most likely -- management will probably schedule it with them.

SOPHIA MERK: And since they are public meetings, they will be open to the public also?

MR. STORM: That I don't know. These will be government-to-government consultation from the Federal government to the Indian tribe on their reservation, their property, and anything public would be through them, only if they -- you know, I presume that they would allow it. But that kind of a meeting, if they request it, would be government to government and not the general public.

SOPHIA MERK: Thank you, and that's all I have.

MR. STRAND: Jeff Aardahl.

JEFF AARDAHL: Good evening. I'm Jeff Aardahl. I represent Defenders of Wildlife. I'm from the Defenders of Wildlife office in Sacramento, California. My title is California Representative, and I have a number of questions similar to the way Tom Budlong began, and then I also have a few general comments, or I suppose you might label them issues or concerns I'd like to just briefly state. And then I will follow up when I return to my office with a

detailed written document for you.

But just to begin with some questions, could you identify where the boundary of the Coso KGRA is and let me know, going back to -- let's see, '80, '90 -- almost 20 -- 29 years now, were any leases issued in the KGRA for Coso that expired because of non-development or non-plan of development? Is part of this area here within that former Coso KGRA?

MR. HAGERTY: That is correct. The KGRA itself, the boundary came up to just to the east side of where the applications are pending right now. It also moved down to the south, came out to the west a little bit. A little nub came out and went back, and basically everything to the far side of my hand here was in the Coso KGRA.

There were applications. There were leases that were issued back -- several geothermal competitive lease sales were held in the 1980s. One was held, I believe, in 1981. There was another one in 1985 where leases were issued, and there were some leases that were issued, part of the sales that no activity ever occurred on. The names of those -- I have a complete record of all of them, but you were correct. There were leases that were issued where no activity was taken. The leases dropped -- fell by the

fb1609b7-d0c5-40c2-a4d9-7191c0357e79

wayside.

The rest of the boundary of the KGRA goes off the boundary to the east, so way out there.

JEFF AARDAHL: Okay. So are any of these decisions from the Coso Geothermal Record of Decision back in 1980 or '81 going to be carried forward as still valid today if it overlaps the same land within this Haiwee zone? In other words could you just bring forward decisions from the previous geothermal effort there rather than go through the whole process again to address the same piece of property?

MR. HAGERTY: We'll have to go through the process all over again. Whatever was developed back in 1981 certainly will be utilized as a reference for the new document. But in terms of Endangered Species Act issues, in terms of National Historic Preservation Act issues, all that, many things have occurred since '81 that need to be readdressed.

If there are recommendations from the Record of Decision at that time that are still pertinent, I would imagine they would be incorporated. But since it's been such a lapse of time and since normally we have a document that we would be making a determination of NEPA adequacy, clearly the 1981

document for this area, we need to do it again, at least for this area.

JEFF AARDAHL: Okay. During the process will we be able to get a copy of the 1980 -- the decision so we can kind of track and kind of see how things are changing with regard to proposals for leasing?

MR. HAGERTY: The document will, absolutely. It's a public document. I'm sure there's a copy in the Ridgecrest office. If not, I know I've got a copy in my office, so I'm sure it's available. They will let you see that. I can make sure that it's available if anybody wants to see it.

JEFF AARDAHL: Okay. Thanks. And somebody, I think, in the introduction mentioned -- maybe it's you, Sean -- that you're working on a reasonable development scenario for this particular area. And will we be able to see what is a reasonable foreseeable development scenario for this area before our scoping comments are due?

MR. HAGERTY: Sure. And at the previous meetings Sophia asked for a copy, and I can make a copy available. What we did, myself as well as petroleum engineer, Rich Estabrook in our Ukiah office, is, given the data available -- and there

isn't any drilling data out there, so all we can do is look at the geology and look at the Coso operation as it is today and make some assumptions that there is a volcanic field here. It most likely is of a certain temperature and depth that we don't know how deep; we don't know the exact temperature.

Rich and I came up with a proposal that we would consider up to two 30-megawatt power plants. They would be dual flash type plants similar to what we see in Coso. We made the assumption that the entity would have to drill down anywhere between 8- to 10,000 feet to reach a resource but just a developable model, and then from that model that we look at how many surface acres are going to be impacted.

So we said for each power plant we would look at about 25 acres for the power plant itself. Each power plant then would need an addition- -- it would have up to 22 wells, 15 production wells, approximately seven injection wells that would add to the total of the impact, now taking it up to over 50 acres per power plant.

In addition to that, then you have access roads, transmission lines. Again that's all described in the RFD, and I can make sure that's available to you as well. But it's just a guess. I ask you that,

in reading this, to understand that we're taking a crystal ball, because from that and then through the NEPA document we'll see what sort of impacts will occur at about, say, 200 acres of that impact in this area or that area or whatever. So it's just our best guess. If we had more data, we could fine tune it, but we don't.

JEFF AARDAHL: Okay. Those are the questions I had. And should I hand it over to somebody else? And I would like to, before I close, come back and just make a few observations at a later time.

MR. STRAND: Okay. Lee Sutton.

LEE SUTTON: Hi. I'm Lee Sutton. I'm vice president of Kern Pres. Audubon Society. I'm primarily interested in the subsurface water resource in Rose Valley and participated and followed the Hay Ranch Pipeline controversy significantly. I understand -- and I may be wrong on this, but I think the cognizant agency for the subsurface water is Inyo County, and if that's so, I'm wondering when you will involve Inyo County in this process.

MR. DALTON: Yes. We've just now begun the scoping process, as you're aware. We have sent letters out to the County. I spoke last night with an individual in regards to the Planning Department, so we want to seek out our partners early on. That's presently where we're at.

So while scoping is going on, besides the letters going to local government and tribal members, our cooperating agencies, they certainly will be brought in as a group. And we're starting to put together core groups. That's the next step in this process. Does that answer your question, more or less?

LEE SUTTON: Yes. That's my only question.

MR. STRAND: Is that your only question? Okay. Dick Arruda. Arruda?

DICK ARRUDA: Dick Arruda. You touched on it a little bit. Just wanted a little bit further clarification on the non-competitive leases that are in for those three. I'm trying to understand. Right now you're proposing that to include the whole area, the 22,000-some-odd acres that includes those three competitive leases. If something in the scoping process, you know, comes up and there's issues and you don't go forward with that, how will you move forward with the three non-competitive leases that you have applications for?

MR. HAGERTY: As part of the process, again, some of the discussions on alternatives have come up already. The three non-competitive applications we have pending since 2002, in the process conceivably we could address to offer them -- or not to offer them or -- because of the environmental concerns, we can actually deny them. But that is a separate decision there.

The other decision that would be put together for the other 18,000 acres -- 18 plus four; that would be 22,000 -- is that, should we offer this as competitive? So there's a whole mixture of alternatives that could be involved, depending on reasonable foreseeable development scenario, how much acreage would be impacted here and what sort of service resources will be impacted as a result of that development. So it encompasses those things.

But through this process, again, we could issue this. We could deny it. Or in the case of the no-action alternative, we just won't do anything with it. It will just sit there. But as I mentioned earlier, under the 2005 Act we do have the deadline of August, 2010 to eliminate -- to process 90 percent of our backlog lease applications in the Western United States. And so we're being asked to address all of

our backlog.

MR. STRAND: Those are all the speaker cards we have. Did you want to make a few more comments, then?

Yeah. Let's go here first. Then we'll come back to you.

TOM BUDLONG: You're so quiet back there. It's not on. You're so quiet; I didn't know you were here. Could you describe the cultural resources in this area.

MR. STORM: Yes. There are quite a few cultural resources, as they're called. For the history, we've got the Southern Pacific Railroad and Work Camp associated with the Southern Pacific Railroads from Mojave to Lone Pine. There is the Los Angeles Aqueduct, both the first and the second aqueduct and the various labor camps, certain camps associated with those. And there is some homesteading out in Rose Valley.

Prehistorically Rose Valley is the primary obsidian reduction quarrying area, making a hole in the ground or a piece of rock from an outcropping. Basically it's not only for California but Nevada and, to a certain extent, the Western United States. And a major project for archeologists working in the region,

they are trying to delineate the historical sequence that went on for about 3- to 5,000 years of people living, working in Rose Valley, going through these obsidian crops, which mostly occur on China Lake Naval Weapons Station, and bringing them back to their villages and reducing them down to hand-size pieces of obsidian called biofacies, and then these biofacies were taken by craters across the Sierra east across the desert to the southwest into Nevada, Utah and all through most of Southern and Central California as the main obsidian source, tool source for the prehistoric peoples.

So there are a number of large village sites that have what's called midden, m-i-d-d-e-n, soil deposits and much lithic scatter. So as it pertains to this particular project, there will be, you know, a cultural resource survey, a field-intensive survey of probably what's called a Class One literature search, and then perhaps a Class Two sampling of the area within the proposed leasing boundary for the EIS preparation to judge what the extent of the universe of known information sites that are out there. And then from that, eligibility potentials and then leasing potentials.

And with large plants such as this, there's also, then, usually a standard where, you know, the broader, you know, umbrella, that this is a sensitive area, and if there is any specific project construction projects like a geothermal electrical production plant, then that specific proposal will then get its own, you know, very detailed, very intensive survey of the area of their footprint, as it's called.

But for the planning right now, any fieldwork will probably be in a sampling scientific sample to ascertain, you know, the general overall pattern. But it's understood there is a lot there.

MR. GUM: I said that in three words.

TOM BUDLONG: It gives me a good idea.

MR. STORM: Anything else?

MR. STRAND: Jeff, did you want to ask some questions?

JEFF AARDAHL: Just one more. Then I want to make observations. Since the decision coming out will be whether or not to issue leases here within this boundary, would it be perhaps appropriate to refer to this area as a geothermal leasing study area rather than to state that it is a leasing area at this time? Just to clarify the terminology, is this really a study area rather than a leasing area?

MR. DALTON: We're certainly open to that, so thank you.

JEFF AARDAHL: Okay. Okay. Good. And I just wanted to make a couple of statements here about recent BLM California Desert Conservation Area Plan commitments to the public.

The first one goes back 29 years ago to the 1980 Desert Plan. The most recent ones that I believe occurred in 2006 with the West Mojave amendments to that 1980 plan, and I just want to bring up the relationship of those decisions to the Mojave ground squirrel viability and long-term conservation.

In 1980 BLM dedicated an area of about 18,000 acres in Rose Valley as the Mojave Ground Squirrel Habitat Management Area. It was referred to as the Rose Valley Mojave Ground Squirrel Area. Unfortunately that management plan was never written. When the BLM does write that plan, it requires the full participation of the State Fish and Game office.

And I was up in the study area today in a number of places, and I mapped that Rose Valley Habitat Plan Area, that commitment from 1980, and it -- oh, I think it overlaps just under half of this particular study area, roughly. I think this study area is about 22,000 acres of Federal land, and I

think the Mojave Ground Squirrel Habitat Management Area from 1980 is at about 10,000 acres.

Now, complementing that, in 2006 the West Mojave Amendment also established a much larger ground squirrel conservation area. The primary decision there was that anywhere within this zone, Federal land, if a project were to occur, it would require the habitat replacement or compensation at a ratio of five acres to one acre disturbed. And for the life of the plan, which is 30 years, the limitation on habitat disturbance within this greater conservation area for the ground squirrel is limited to one percent.

I just want to bring that up just so that's factored into the analysis that we're going to be seeing. And that concludes everything I have tonight, and I thank you very much for the opportunity.

MR. DALTON: Thank you, Jeff.

MR. STRAND: Yes. Go ahead. Can you state your name again.

DICK ARRUDA: Dick Arruda. One thing that comes to mind when you're looking at plan development and looking at cooperation with utilities et cetera, what are we thinking in regards to transmission? You know, we can have all kinds of resources out there. Are we thinking down the road

about -- you know, we already have problems with transmission through this area, and if we put something in out there, other things are going to have to happen. You know, it would be a shame if something did come to be developed out there, and now we're going to bump into another wall, and that's transmission and the ability on your lands -- BLM lands all the way down to L.A. Are we thinking any about that or what's happening in that regard?

MR. STRAND: I'll say something real quick of what I know, and I'll let Sean speak to it. South of here there are current proposals: The Barren Ridge area south, transmission lines that are being -- they're in the planning stage right now and looking at being under construction in the next couple of years. So between here, this area, and that Barren Ridge area, I know of no current proposals. But certainly that would be something that we would have to look at to get the energy out.

MR. HAGERTY: And that's an excellent question because last night during our public scoping meeting in Bishop, of course, is the consideration of a 500-kV line coming in through the center of Nevada basically tying into Bishop someplace that would carry forth a lot of energy from Nevada going into Edison's territory.

So it's a domino effect. In other words, if that project is to proceed and it does reach completion over the next, you know, four or five years, then the existing 230-kV lines that Edison has in the Rose Valley area, I believe that just won't make it. So as part of this project, certainly that's consideration as far as what transmission could be utilized.

But again our decision here is primarily on the issue of leasing. If the decision is made to lease and somebody comes forward, it's part of our coordination effort to make sure that we are in contact with the various entities. But we are going to leave that up to the operator.

And again the question that also came up from previous nights, do the gentlemen that have the applications right now -- do they have power purchase agreement? I don't know. I don't know. So there's a lot of issues there too. So that's a very good question.

Certainly we don't want to approach the bottleneck on the transmission lines, because obviously, if we do have a viable resource here, we want to make sure it gets out and becomes part of the

renewable energy portfolio for California.

MR. STRAND: Any other questions?

TOM BUDLONG: I could ask one.

MS. CADAVONA: Name?

TOM BUDLONG: Tom Budlong. When Terry Metcalf, I guess, talked to the steering committee some number of years ago he, was talking about the State section only, and now he's talking about these. Do you know if he's given up on the State section, or is this easier for him to deal with because it's closer to the road? Do you have any idea why he moved?

MR. STRAND: I understand he has a current lease on the State section and he has an approved right-of-way for an access road for the BLM to access that State property. I don't have information on these current leases or these applications.

MR. GUM: He has actually two rights-of-way, one for the road to access the State section, another for a pipeline to carry water to that State section for the drilling purposes. Why Deep Rose has chosen not to drill at this point in time, you need to talk to Deep Rose and find out what they have to say. I know they're interested in trying to

get those non-competitive leases to tie up those acres, and I don't know that if they do, then that means they'll actually drill or not. So that's speculation on our behalf to try to say why it is they haven't stepped forward.

MR. STRAND: Okay. Thank you guys again for coming. What we're going to do is, we're going to be here for as long as you guys are here. If you have more questions, feel free to look at the boards, ask more questions one on one. And again thank you guys for coming. We appreciate your guys' participation.

(Applause from the audience.)

(The proceedings were concluded at 7:02 p.m.)

-OOO-

REPORTER'S CERTIFICATE

I, DIANE CARVER MANN, a certified shorthand reporter, do hereby certify that the foregoing pages comprise a full, true and correct transcription of the proceedings had and the testimony taken at the hearing in the hereinbefore-entitled matter of the BLM Scoping Meeting for the Haiwee Geothermal Project.

Dated this 18th day of November, 2009, at Chino, California.

DIANE CARVER MANN, CSR NO. 6008

THIS PAGE INTENTIONALLY LEFT BLANK.

APPENDIX E: SCOPING HANDOUTS

Fact Sheet

HAIWEE GEOTHERMAL LEASING AREA

SCOPING MEETINGS • OCTOBER 2009

Haiwee Geothermal Leasing

The Department of the Interior, Bureau of Land Management (BLM) is proposing the leasing of the Haiwee Geothermal Leasing Area located in Inyo County, California for geothermal exploration, development, and utilization. The area encompasses approximately 22,500 acres of BLM-managed public lands that also include three pending lease applications covering approximately 4,500 acres.

The Haiwee Geothermal Leasing Area is approximately 13 miles south of Olancha, California. The project area is east of the Inyo National Forest, west of the Naval Weapons Center, and south of the South Haiwee Reservoir.

Geothermal Resources

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 can be accessed by wells, and the heat energy can be used for generating electricity.

Geothermal fields produce only about one-sixth of the carbon dioxide that a relatively clean natural-gas-fuel power plant produces, and very little if any, of the nitrous oxide or sulfur-bearing gases. Geothermal energy is available 24 hours a day, 365 days a year. Geothermal power plants may be the most reliable of all energy production methods, because they do not require purchase or transport of fuel, or waste disposal, and have no intermittency or dispatchability problems.

Geothermal energy is a renewable resource, because its source, the Earth's core, provides an almost unlimited amount of heat. Tapping into clean, renewable geothermal energy will help reduce greenhouse gas emission associated with other types of power plants.

Purpose and Need

The development of domestic energy resources, particularly renewable resources, has become a national priority. 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. In response to the executive order, the BLM issued a National Energy Policy Implementation Plan in June 2001, which directed the BLM to process geothermal leases in a timely manner in order to help support efforts to increase energy production from federal minerals, while preserving the health of the public lands.

In August 2005, President Bush signed into law the Energy Policy Act of 2005 that encourages energy efficiency and conservation, promotes alternative and renewable energy sources, reduces our dependence on foreign sources of energy, and increases domestic production. It made significant changes to the Geothermal Steam Act of 1970, to encourage leasing and development of geothermal resources from public lands.

The California Desert Conservation Area (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 BLM directly administers about 10 million acres of the CDCA, which includes the Haiwee Geothermal Leasing Area. 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 plan is based on the concepts of multiple use, sustained yield, and maintenance of environmental quality. The plan would be amended to allow the Haiwee Geothermal Leasing Area lands to be leased for geothermal exploration, development, and utilization.

The BLM received three noncompetitive geothermal lease applications for approximately 4,500 acres of BLM-managed lands within the Haiwee Geothermal Leasing Area and must determine whether to approve the applications. Adjacent public lands occupying approximately 18,000 acres have also been identified for competitive leasing of geothermal exploration, development, and utilization and BLM must decide whether to offer competitive leases for geothermal resources in the leasing area.

Although this is a Federal action taking place on Federal land, this proposal will also assist the State of California with its Renewable Portfolio Standard goals that call for 33 percent of California's energy to be derived from renewable sources by 2020.

Project Description

BLM is proposing leasing of geothermal resources in the Haiwee Geothermal Leasing Area, which consists of approximately 22,500 acres of BLM-managed lands; this area also includes the three lease applications for approximately 4,500 acres of BLM-managed lands. The BLM-managed lands considered for leasing are located in the Mount Diablo Meridian and occupy the following 37 sections:
Township 21 South, Range 37 East, Sections 11-14, 23-26, 35-36
Township 21 South, Range 38 East, Sections 7-10, 15, 17-22, 27-34
Township 22 South, Range 37 East, Sections 1-2, 11-12
Township 22 South, Range 38 East, Sections 5-8

The proposed action is to amend the CDCA Plan to allow project area lands to be leased under the authority of the Geothermal Steam Act of 1970, as amended (30 U.S.C. 1001 et seq.).

The approval to issue geothermal leases could have indirect environmental impacts because such leasing represents a commitment of resources, and it is reasonably expected that subsequent exploration, development, production, and decommissioning activities would occur. A lease for geothermal resources allows the right to future exploration and development of geothermal resources within the lease area; however, subsequent activities involving surface disturbance or other extensive operational activities specific to a project will require additional NEPA analysis.

Environmental Review

Issuing leases for the exploration, development, and utilization of geothermal resources is considered a Federal action and may have a significant adverse impact to the environment. The BLM will prepare an Environmental Impact Statement (EIS) in compliance with National Environmental Policy Act (NEPA) to identify, analyze, and disclose potential environmental effects of leasing geothermal resources.

BLM is conducting scoping for the proposed leasing of geothermal resources to identify issues to be addressed, and identify the range of actions, alternatives, mitigation measures, and significant effects to be analyzed in-depth in the EIS. The anticipated release of the Draft EIS/Draft Plan Amendment to the CDCA is Winter of 2009. The publication of a Notice of Availability in the Federal Register will announce the release of the report and start of the 90-day comment period. Formal public meetings will also be conducted during this time. The Final EIS/Proposed Plan Amendment is expected in Fall of 2010 and another Notice of Availability will be published to announce the release, as well as start of 30-day protest period and 60-day Governor's Consistency Review. A Record of Decision to open or close leasing of geothermal resources in the Haiwee Geothermal Leasing Area and amendment to the CDCA is expected in Winter 2010.

Public Outreach and Communication

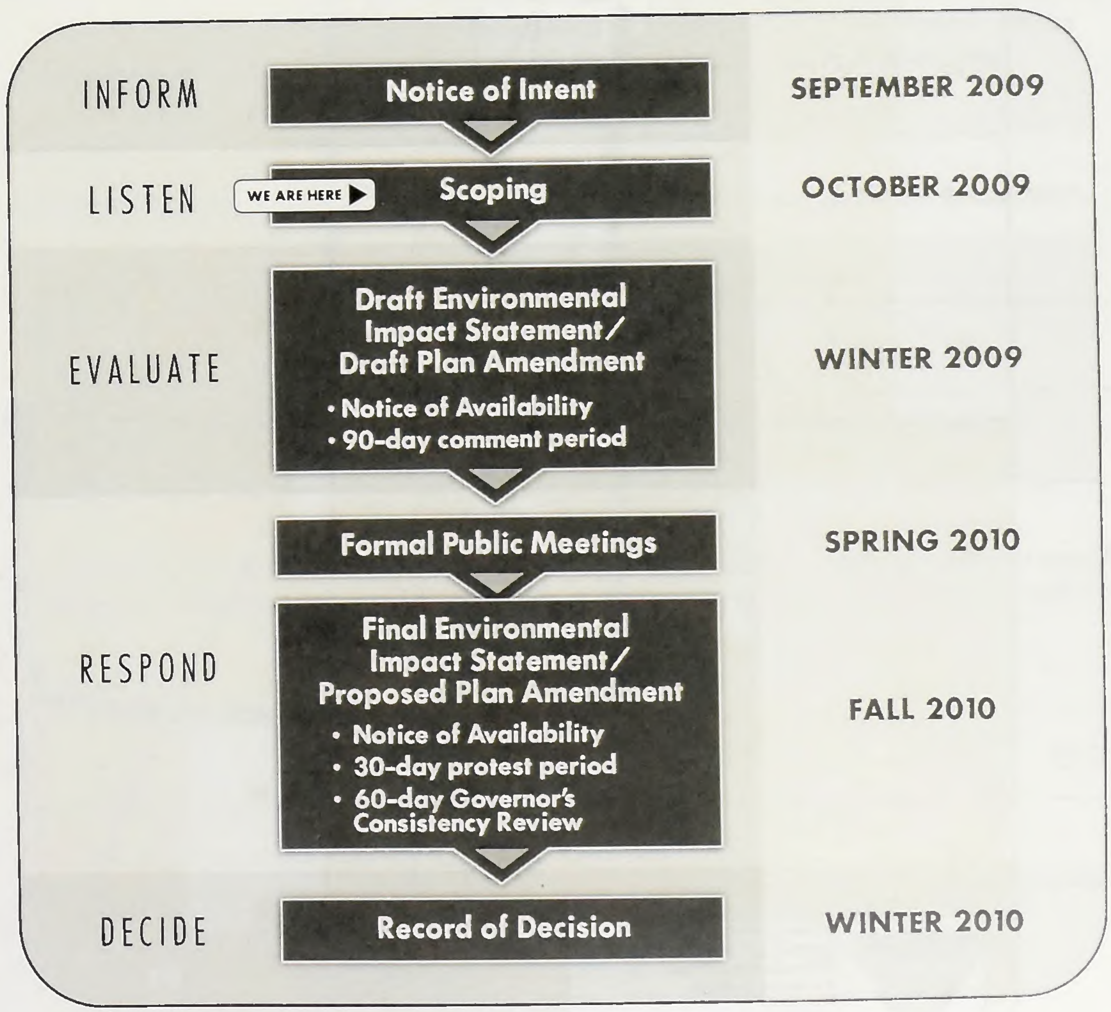
The project team welcomes comments and involvement throughout the project and appreciates your feedback. Comments concerning the scope of the environmental analysis are requested by close of business Monday, **November 9, 2009**. If you have questions or comments about the project, or would like to be added to the project mailing list, please contact the project team in one of the following ways:

- Attend one of the public scoping meetings
- Visit the project website www.blm.gov/ca/st/en/fo/ridgecrest.html
- Send an email to cahaiwee@blm.gov
- Send written comments to:

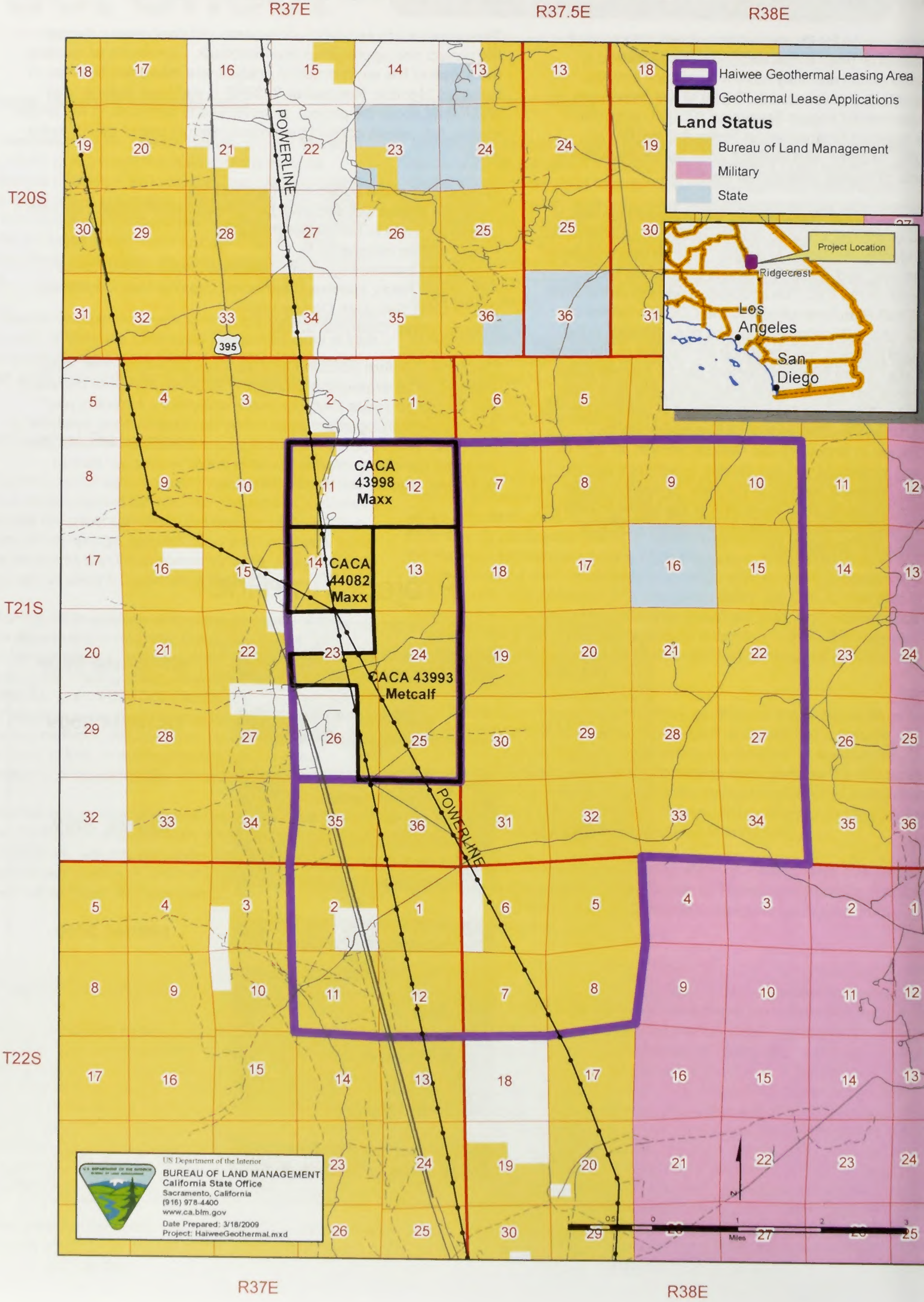
Bureau of Land Management, California Desert District Office,
Attn: John Dalton, Haiwee Geothermal Leasing Area Coordinator
22835 Calle San Juan De Los Lagos
Moreno Valley, California 92553

Disclaimer: Before including your address, phone number, email address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Project Timeline



Haiwee Geothermal Leasing Area



Comment Form

The Bureau of Land Management (BLM) thanks you for your interest in the Haiwee Geothermal Leasing Area. Scoping meetings are being conducted to share information regarding the proposed action and the decision-making process, and listen to the public views on the range of issues to be considered during the preparation of the Draft Environmental Impact Statement/Draft Plan Amendment. Please take a moment to answer the questions below and return this sheet to the comment table or mail to the address on the back of this form.

We encourage you to provide your comments by filling out and submitting this comment form to the address on the opposite side, or you may e-mail your comments to cahaiwee@blm.gov. All comments (letters and emails) for consideration in preparation of the Draft Environmental Impact Statement must be received by close of business ***Monday, November 9, 2009****.*

NAME: ______________________________ DATE: ____________

ADDRESS: ______________________________

CITY/STATE/ZIP: ______________________________

EMAIL (optional): ______________________________

Would you like to be added to this project's mailing list to receive future project-related information? ☐ YES ☐ NO

Please indicate your affiliation by checking one of the following boxes:

- ☐ Individual (no affiliation)
- ☐ Private Organization
- ☐ Citizen's Group
- ☐ Federal, State, or Local Government
- ☐ Elected Representative
- ☐ Regulatory Agency

Name of organization, government, group, or agency (if applicable)

____

If you wish to withhold your name or address from public review or from disclosure under the Freedom of Information Act, you must state this prominently in your comments. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives of organizations or businesses, will be made available for public inspection in their entirety.

Please describe any issues that should be considered during resource studies and in environmental resource document preparation.

____

____

____

Please describe any environmental concerns regarding geothermal development. If applicable, please relate these concerns to specific locations, features (landmarks, water bodies, historic or tribal sites, etc.) or resources (plants, animals, water quality, air quality, etc.).

____

____

____

HAIWEE GEOTHERMAL LEASING AREA

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

Please provide any additional comments that you may have on the project.

Fold Here

Fold Here

HAIWEE GEOTHERMAL LEASING AREA

BLM, California Desert District Office
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
Attn: John Dalton, Haiwee Geothermal
Leasing Area Coordinator

POSTAGE REQUIRED

BLM, California Desert District Office
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
Attn: John Dalton, Haiwee Geothermal
Leasing Area Coordinator

APPENDIX F: SCOPING LETTER TO NATIVE AMERICAN TRIBES

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Ridgecrest Field Office
300 S. Richmond Road
Ridgecrest, CA 93555
www.blm.gov/ca/ridgecrest

OCT 07 2009

In Reply Refer To:
8120 (P) CA-650.22

Return Receipt Requested: 7008 1830 0002 2907 6450

Mr. Monty Bengochia, Tribal Council Chair
Bishop Paiute Tribe
50 Tu Su Lane
Bishop CA 93514-8058

Ref: Haiwee Geothermal Leasing Area Proposal

Dear Mr. Bengochia:

It is a pleasure to invite the Bishop Paiute Tribe to consult with the Ridgecrest Field Office, Bureau of Land Management (BLM) as part of our government to government responsibilities regarding a recent geothermal energy leasing initiative being undertaken by BLM in northeast Rose Valley, Inyo County. We would like to apprise you of this proposed project so that any Tribal concerns or issues regarding them can be identified and discussed at the earliest opportunity in the application review process.

The undertaking is known as the Haiwee Proposed Geothermal Leasing Project, and involves the potential leasing of 22,060 acres of BLM managed public lands for geothermal exploration, development, and utilization. An Environmental Impact Statement (EIS) will be prepared, and a series of public meetings and a public comment period are being scheduled.

The geographic location is generally east of US Highway 395 between the Caltrans Rest Stop at Coso Junction on the south and the South Haiwee Dam locale to the north. The eastern boundary is the China Lake Naval Air Weapons Station (NAWS).

The legal locations of the proposed leasing area are: Township 21 South, Range 37 East and Range 38 East; and Township 22 South, Range 37 East and Range 38 East; Mt. Diablo Base and Meridian. The 7.5 minute topographic quad sheets for the area are: Coso Junction and Haiwee Reservoir.

BLM is initiating the NEPA environmental review of this proposal by holding a series of public meetings between October 13 and 20, 2009. A meeting notice is enclosed with details, but briefly, meetings will be held near Lone Pine on Oct. 13, Bishop Oct. 14, Ridgecrest Oct 15, and Furnace Creek Ranch/Timbisha Tribal Offices in Death Valley NP on Oct. 20, 2009. BLM will also utilize and coordinate the NEPA commenting process to satisfy the public involvement process for Section 106 of the National Historic Preservation Act (NHPA) (16 U.S.C. 470F) as provided for in 36 CFR 800.2(d)(3).

If you or other members of your Tribe has any comments or concerns regarding the proposed Haiwee Geothermal Leasing Project, we would appreciate receiving any responses by mid-November, 2009. A suggested deadline date for receipt of comments would be Friday November 20, 2009. Responses by letters or email would be acceptable.

In closing, thank you for your considerations regarding this consultation request. If there are any questions, please contact myself, at (760) 384-5400, email Hector_Villalobos@ca.blm.gov; or John Dalton, Desert District Planning and Environmental Coordinator at (951) 697-5311, email John_Dalton@ca.blm.gov. Please address written responses to my attention at: BLM, Ridgecrest Field Office, 300 South Richmond Road, Ridgecrest CA 93555. Thank you.

Sincerely,

Hector Villalobos

Hector Villalobos
Field Manager
Ridgecrest Field Office
Bureau of Land management

Enclosure:: 4 Public Meeting Notice
Legal Location Worksheet
Notice of Intent to Prepare EIS
Map of Haiwee Geothermal Leasing Area

APPENDIX G: SCOPING LETTERS TO ELECTED OFFICIALS

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
California Desert District Office
22835 Calle San Juan De Los Lagos
Moreno Valley CA 92553-9046

In Reply Refer To:
3210
CAD000.01(P)

November 25, 2009

CERTIFIED MAIL #70091410000184211070
RETURN RECEIPT REQUESTED

Linda Arcularius
Supervisor, District 1
Inyo County
225 N. Round Valley Road
Bishop, CA 93514

Dear Supervisor Arcularius:

The Bureau of Land Management (BLM), California Desert District (CDD) is giving notice to initiate a public scoping period to identify issues and formulate alternatives for an Environmental Impact Statement (EIS) for the Haiwee Geothermal Leasing Area located in Inyo County, California. We would like to invite the County of Inyo to participate in this process.

The CDD-BLM directly administers approximately 10.4 million acres of public land within the California Desert Conservation Area (CDCA), which includes the Haiwee Geothermal Leasing Area. The land use plan for the CDCA, based on the concepts of multiple use, sustained yield, and maintenance of environmental quality would be amended to allow, if approved, the Haiwee Geothermal Leasing Area lands to be leased for geothermal exploration, development, and utilization. The leasing of public lands for geothermal resources will require an amendment to the CDCA Plan, which is authorized by the Federal Land Policy and Management Act 202.601 (43 U.S.C. 1712) and 43 Code of Federal Regulations 1610.5-5.

Project Description

The Haiwee Geothermal Leasing Area is approximately 13 miles south of Olancha, California. The proposed project area is east of the Inyo National Forest, west of the Naval Weapons center, and south of the South Haiwee Reservoir, encompassing approximately 22,500 acres of BLM-managed public lands. The BLM has received three noncompetitive geothermal lease applications for approximately 4,500 acres of BLM-managed lands within the Haiwee Geothermal Leasing Area and must determine whether to approve the applications. Adjacent public lands occupying approximately 18,000 acres have also been identified for competitive leasing of geothermal exploration, development, and utilization and BLM must decide whether to offer competitive leases for geothermal resources in the leasing area.

The BLM-managed lands considered for leasing are located in the Mount Diablo Meridian and occupy the following 37 sections:
Township 21 South, Range 37 East, Sections 11-14, 23-26, 35-36
Township 21 South, Range 38 East, Sections 7-10, 15, 17-22,027-34
Township 22 South, Range 37 East, Sections 1-2, 11-12
Township 22 South, Range 38 East, Sections 5-8

National Environmental Policy Act Process

In processing applications the BLM must comply with the requirements of the national Environmental Policy Act (NEPA), which requires that federal agencies review projects under their jurisdiction and consider the environmental impacts associated with the proposed project construction and operation.

Pursuant to the National Environmental Policy Act (NEPA) and the Council on Environmental Quality regulations on implementing NEPA, the EIS will describe and evaluate the potential impacts of the Haiwee project, no action, and any other alternatives to the proposed action. The purpose of an EIS is to provide the public and decision makers with sufficient information to understand the environmental consequences of the proposal and to identify and develop appropriate mitigation measures to minimize environmental impacts. The impact analysis presented in the EIS will result in a Record of Decision for the project.

Scoping

One early element of the NEPA process is scoping. Scoping activities are conducted early in the process to:

- determine reasonable alternatives to the proposed action that will be considered in the document
- identify environmental and socioeconomic issues of concern related to the proposed project and
- determine the depth and range of analyses for issues addressed in the document.

This scoping statement has been prepared to enable government agencies, the general public, and other interested parties to participate in and contribute to the analysis process. Public input is important in establishing the scope of analysis for any NEPA document, and the BLM encourages public participation.

Preliminary Resource Management Issues and Concerns

The following issues and concerns have been identified to-date as relating to the proposed action. This list is not meant to be all-inclusive, but rather to serve as a starting point for public input. Once all issues and concerns have been gathered through scoping and BLM consideration of the project, corresponding resource disciplines will be identified to conduct analysis for individual issues and concerns. Issues already identified to be analyzed in the EIS include:

- Native American
- potential land use conflicts including recreation
- potential effects on wildlife
- cumulative impacts considering existing, proposed, and potential geothermal projects in the area

- potential impacts on surface water and groundwater resources
- potential impacts to cultural and historical resources within the analysis area
- potential impacts to visual resources.

The EIS will also address issues such as geology, geothermal resources, vegetation, threatened or endangered species, air quality, noise, transportation, human health and safety, and socioeconomics, as well as any other issues raised during the process.

Alternatives thus far identified for evaluation in the EIS will include the (1) proposed action, (2) no action alternative (not leasing the lands for geothermal exploration, development, and utilization), and (3) leasing fewer than the proposed 22,500 acres of public land.

The BLM will use an interdisciplinary approach to develop the plan in order to consider the variety of resource issues and concerns identified.

Proposed Schedule

The anticipated release of the Draft EIS/Draft Plan Amendment to the CDCA is winter of 2009. The publication of a Notice of Availability in the Federal Register will announce the release of the report and start of the 90-day comment period. Formal public meetings will also be conducted during this time. The Final EIS/Proposed Plan Amendment is expected in Fall of 2010 and another Notice of Availability will be published to announce the release, as well as start of the 30-day protest period and 60-day Governor's Consistency Review. A Record of Decision to open or close leasing of geothermal resources in the Haiwee Geothermal Leasing Area and amendment to the CDCA is expected winter of 2010.

You are encouraged to participate throughout the environmental analysis process to help in identifying the level of analysis needed, alternatives to be considered, issues or concerns that should be assessed, mitigation opportunities, and any other comments or ideas to help ensure that the process is comprehensive. Please submit your comments to John E. Dalton, Resource Management Specialist and Haiwee Project Lead, at John_Dalton@ca.blm.gov

Thank you for your consideration and the opportunity to work effectively with you. We look forward to our interaction and discussions.

Signed By
Steve Borchard
District Manager

Authenticated By
Charlee C Christe
Records Manager

Enclosures (2)
Haiwee Map, NEPA process

CC: Inyo District Supervisors

Appendix H: Comment Letters

ARNOLD BLEUEL
LAROCHELLE MATHEWS &
ZIRBEL LLP
ATTORNEYS AT LAW

GARY D. ARNOLD
BARTLEY S. BLEUEL*
DENNIS LAROCHELLE
JOHN M. MATHEWS
MARK A. ZIRBEL
KENDALL A. VAN CONAS*
SUSAN L MCCARTHY
AMBER A. EISENBREY
STUART G. NIELSON
ROBERT S. KRIMMER

OF COUNSEL
MATTHEW P. GUASCO

300 ESPLANADE DRIVE, SUITE 2100
OXNARD, CALIFORNIA 93036
TELEPHONE: 805.988.9886
FAX: 805.988.1937
www.atozlaw.com

Writer's e-mail
garnold@atozlaw.com

October 7, 2009

Bureau of Land Management
California Desert District Office
Attn: John Dalton, Haiwee Geothermal Leasing Coordinator
22835 Calle San Juan De Los Lagos
Marino Valley, CA 92553

Re: EIS Scoping Meeting
Haiwee Geothermal Project
22,060 Acres

Gentlemen:

Little Lake Ranch, Inc. ("LLR") is a non-profit mutual benefit corporation which owns the Little Lake Ranch property at the far southern end of the Rose Valley, which itself is located in the most southerly region of the Owens Valley in the County of Inyo, California. LLR submits the comments contained herein regarding the Environmental Impact Statement ("EIS") being prepared by BLM in connection with the proposed geothermal exploration and development project located in and around the Haiwee area.

LLR suggests that BLM consider all of the comments, evidence, studies and reports generated in connection with environmental analysis of the water pumping and transfer project ("Coso Project") originally proposed by Coso Operating Company, LLC ("Coso"). The Coso Project was the subject of the Environmental Assessment, No. CA-650-2005-100, case file number CACA046289 ("EA") published by BLM. To the extent that the proponents of the geothermal exploration and projects being studied by the BLM ("Projects") will rely upon the water contained in the Rose Valley underground water basin, all of such data must be considered. The same types of environmental impacts which were studied in the EA and the later Final Environmental Impact Report ("EIR") adopted by the County of Inyo, will also occur under the Projects. You should refer to the entire files assembled by the County of Inyo ("County") in connection with the Coso Project, as well as BLM's own environmental files which separately granted a right-of-way to Coso.

* Certified Specialist, Estate Planning, Trust and Probate Law State Bar of California Board of Legal Specialization

Little Lake Ranch Background.

Little Lake Ranch consists of approximately 1,200 acres ("LLR Property") which is managed by LLR to provide wildlife habitat and wildlife-oriented recreation, including hunting, fishing, and wildlife viewing. The LLR Property includes a shallow 90 acre navigable body of water known as "Little Lake" and the ponds and wetlands areas including the Upper Pond, Lower Pond, Teal Pond, Lava Pond, and Chukar Pond.

Wetlands are extremely limited along the Eastern Sierras. Much of the wetlands habitat that historically occurred in the region has been lost to water diversions and agricultural conversions. Little Lake is one of the few sizable wetlands sites remaining along the Eastern Sierras. This 90-acre lake is used extensively by waterfowl and likely receives more use by diving ducks than any other wetlands in the Eastern Sierra region.

To the extent that the proposed projects rely in whole or in part upon the underground water resources of the Rose Valley, the pumping and transportation of the water is subject to the County's groundwater ordinance and will be cumulative to the water being transported by Coso. Such water transportation would also have a severe and direct impact upon the LLR property. The specific harm to, or impacts upon, the LLR property must be studied.

Project Description.

While the extent of any available geothermal resource is largely unknown during the exploration stage, the existence of the resource should be identified, and its size and composition should be estimated. The amount of electrical production from the geothermal resource should be based upon the size and extent of the reservoir so as to create a sustainable facility. This may reduce the immediate production of electrical energy, but allow for a greater and longer term utilization of the resource, with fewer impacts on the environment as noted below.

The EIS must evaluate the environmental impacts from the alternate designs of available geothermal facilities. The principal designs currently include single-flash systems, double-flash systems, dry steam (depending upon the actual geothermal resource available), binary and any number of hybrid designs incorporating one or more of the foregoing. More exotic designs may further utilize combinations of other energy production methods (fossil fuel, hydroelectric, solar, wind, biomass, etc.), each of which alternate designs pose different environmental impacts. Absent an identification of the projected design of the geothermal facility, it is virtually impossible to accurately assess the ultimate environmental impacts from the utilization of the geothermal resource.

The EIS should identify each alternative design of the proposed facility, and identify the particular environmental impacts associated with each form of a design. Each and all of the designs should be further analyzed to conserve the geothermal resource itself, as well as minimizing any impacts to the environment each of the alternative designs may pose. Each design should consider how toxic emissions will be minimized and the use of water conserved.

In flash-steam facilities, about 15-20% of the fluid would be lost due to flashing to steam and evaporation. Binary power plants utilize a closed-loop system and the geofluids are re-injected with no fluid loss. 85% of the steam used in flash or dry-steam plant is lost to evaporation, when a water-cooled tower is used. The total loss of the "fluids" depends on both the nature of the produced geofuilds, and the type of cooling system, and whether the plant actually re-injects the available fluids. This should be clarified and discussed.

There needs to be a discussion or analysis concerning the proper utilization of geothermal resources. There should be consideration of alternate technologies by which the geothermal reservoirs are managed to allow for the sustainable production of electricity through the conservation of geothermal fluids by the proper design and operation of the production facilities themselves.

There is no question but that water is a very rare and precious commodity in most of the western United States. Large portions of the western United States are subject to current drought conditions. Consumers are being asked to conserve the water they use. Geothermal facilities should be designed, constructed and operated in a manner to avoid the need for imported water and to balance the production of geothermal fluids to the natural recharge of the geothermal resource.

One possible explanation of the problems experienced at some geothermal facilities is their use of water-cooling towers to condense the steam used in the electricity generation process. Unfortunately, by utilizing water-cooling towers, geothermal facilities lose a tremendous amount of the geothermal fluids produced, thereby causing a more rapid depletion of the fluids in the geothermal reservoir. There must be extensive consideration of available alternatives, such as the utilization of an air-cooled system by which 100% of the geothermal fluids can be retained within the system and re-injected into the geothermal reservoir. This alternative may prolong the life of the reservoir and allow for a more sustainable production of electricity from the geothermal plants.

Similarly, the EIS should address the preservation of the geothermal reservoirs through proper long-term management. First, the need to balance the natural recharge of the geothermal reservoirs, compared to the consumption of the fluids from the electrical plants, must be considered. Second, the proper size and production capability of an electrical plant to reduce water consumption merits analysis. In either case, a proper management of the resource could eliminate the need for imported water and allow for a more sustained production over a longer period of time.

The reliance upon imported water is a short-sighted and environmentally risky answer to geothermal reservoir depletion. Because of the scarcity of water throughout the western United States, perhaps such water resources could be better used, rather than simply injecting water into a geothermal reservoir to produce energy. The EIS should address the availability of local water sources for injection, whether such water sources are adequate to supply all competing needs and uses of any projected water used for injection, and whether the imported water source is naturally replenished.

Aesthetics.

Will the depletion of water within the Rose Valley affect habitat and wetlands adjacent to U.S. Highway 395 and the Habitat Project at Little Lake? Will the permanent depletion of the underground water level adversely impact the surface flora and fauna? There should be a baseline study of the surface habitat and all wildlife which rely upon surface water and a functional ecosystem. This study should specifically cover the entirety of the LLR property.

The Rose Valley is essentially a high desert location used largely for recreational purposes. The construction of any manmade structures is particularly visible and detrimental to recreational uses. The cumulative impacts from these structures should be considered.

Agricultural Resources.

The lowering of the water table level in the Rose Valley will exacerbate the costs of all Rose Valley water well owners to pump water, and increase the cost to use available land for agricultural purposes. This needs to be studied.

LLR's Habitat Project includes the use and irrigation of farming plots to enhance wildlife cover and habitat. The ability of LLR to utilize its own property for agricultural or recreational uses is imperiled and needs to be addressed.

Do other agricultural uses or operations exist in Rose Valley? Are they dependent on the natural springs and underground water table for water?

Air Quality.

The loss of valuable wetlands at Little Lake, and perhaps even Little Lake itself as a body of water, could substantially exacerbate wind-raised dust from the Little Lake area. To the extent that the underground water table is lowered, will this have an adverse effect on the surface plants which rely upon the underground water for survival? Will this further contribute to windborne dust and pollution?

The proposed project is located within the Great Basin Unified Air District. The overall air quality is considered poor, principally as a result of wind erosion of the dry Owens lakebed. Will the proposed project reduce water availability to Little Lake, the downstream ponds, creeks and wetlands? Will this adversely impact the air quality of the Rose Valley? These impacts must be studied and evaluated as a potential significant impact.

Will the operation of the proposed project contribute to the non-attainment area for PM_{10} particles? This aspect of the project must be studied and evaluated.

Biological Resources.

Any and all studies of the environmental impacts cannot be limited only to the locations of the physical boundaries of the proposed project or its access routes. The EIS must study all of the areas in and around the LLR property, and the Rose Valley in general, at least to the extent that the loss of water resources would imperil the habitat and vegetation. The permanent loss of water resources within the Rose Valley may have a profound impact upon many biological resources, including at least two endangered species, the Desert Tortoise and the Mojave Ground Squirrel ("MGS").

There are riparian habitats and sensitive natural communities within the LLR property, as well as numerous natural springs and artesian wells throughout the Rose Valley on which wildlife depend. Any decrease in the amount of underground water within the Rose Valley Basin or Little Lake could have a severe impact upon biological resources.

Should long-term baseline studies be prepared before the grant of any permit? These studies could include the actual availability of underground water in storage, historical water levels, recharged and consumption within the Rose Valley Basin, the existence of all wildlife resources, the existence and health of surface vegetation, plant life and habitat, surface flows at Little Lake and its surrounding ponds and creeks, catalog of all springs and artesian wells within Rose Valley, together with their outflows, identification of all water users and their consumption of water within the Rose Valley, current air quality conditions, cultural resources, soils and geology conditions, and the impacts upon such resources as a result of the water pumping project.

Cultural Resources.

BLM has added the Coso Hot Springs as an area of potential effect ("APE") as part of its consideration whether to grant a right-of-way to Coso for its project. A complete analysis of the effects of the proposed project on the Coso Hot Springs must be performed. Information contained in the various environmental studies from the Coso Project is insufficient.

Geology and Soils.

The EIS should examine the possibility of soil subsidence in Rose Valley as a result of the withdrawal of groundwater. Subsidence could occur with extensive long-term overdraft of the groundwater reservoir. This impact must be studied and evaluated. Moreover, the depletion of the underground water basin and surface flows can have a profound effect upon soil erosion, loss of topsoil, and the capability of the surface to sustain life.

Hazards and Hazardous Materials.

What are the impacts to the environment from the operation of the proposed projects? What types of hazardous substances may be generated by the proposed projects and how are they going to be treated or disposed of?

All energy-producing plants emit heat to the atmosphere and environment. This is a natural consequence of power production. Indeed, geothermal power plants emit considerably more heat per unit of energy produced than most power plants, including fossil fuel and nuclear. What are the environmental impacts from heat emissions?

Impacts on geologic resources and seismic issues must be evaluated. The high pressure injection of fluids directly into fault zones has been related to increases in seismic activities. High pressure injection of fluids from outside the geologic system is not the same as where geothermal fluids are withdrawn and then re-injected for a near zero net change, and would represent a much lower risk of increasing seismic activity. This conclusion ignores the dramatic loss of heated liquids from evaporation when WCTs are employed at the facility for cooling purposes. Indeed, if there is no source of make-up water from nearby surface waters or Water Basins, and a WCT system is used, then the GeoReservoir can be substantially depleted of water over time, actually increasing the possibility of seismic activity.

Subsidence can also occur when groundwater is pumped from underground aquifers at a rate exceeding the rate at which it is replenished. Since geothermal development includes re-injection of the geothermal fluids, it is assumed that the potential for subsidence is low. The EIS should address the dramatic loss of heated liquids from evaporation when WCTs are used, and there is a high portion of steam in the geofluids.

Hydrology and Water Quality.

A long-term test pumping should be performed to determine what the short-term, intermediate and long-term impacts from pumping may be. Most of the reports to date rely upon theoretic modeling of the underground basin in the Rose Valley. Prior to the issuance of any permit, should there be long-term pumping of the magnitudes proposed? Would it not be preferable to actually understand the basin dynamics before issuing a permit?

Possible impacts to underground water sources, typically consisting of known underground water basins or aquifers, must be studied. In most cases, the geothermal reservoir, containing heated water or steam, or both, (hereafter called herein "GeoReservoir") exists in the form of a water basin, but it is generally separate and distinct from underground water basins/aquifers ("Water Basins"), which are used by the overlying owners for drinking water, irrigation, domestic uses and other typical residential, agricultural, industrial and commercial uses. As such, there can be much confusion between the relationship of these separate resources. While there may be some hydrological connection between the GeoReservoir and the Water Basins, the EIS should identify the distinction, and evaluate what impacts the use and consumption of the GeoReservoirs may have on the local Water Basins. Are there any connections? If so, what are the environmental impacts? If not, will the Water Basins be used for make-up water in the geothermal plant, and what impacts would this cause on the surrounding environment?

Depending upon the selected design of any geothermal facility, it may require imported water to reach sustainability. This is exactly the case in numerous geothermal facilities around the world. The EIS should consider as an environmental impact the exploitation of a GeoReservoir and the possible need for imported water to reach sustainability. What if the water sources are not readily available or may only lead to mounting environmental problems?

Many geothermal facilities rely upon water cooling towers ("WCTs") to cool working fluids in a binary plant or steam condensate in dry steam, single flash and double flash facilities. In so doing, a substantial portion of the steam (approximately 85% according to published sources) is lost to evaporation during the cooling process, thereby limiting the geofluids which could otherwise be injected.

The EIS should identify throughout the document the different type of fluids that are contained in a GeoReservoir. Numerous different terms are used interchangeably, but should not be. It is not correct to say that all fluids produced at a hypothetical geothermal facility are available for re-injection. Geofluids or fluids can be composed of both liquid and steam. While generally the liquids can be re-injected, that portion of the original geofluids which is steam, may not be re-injected, if the design of the facility uses WCT. Because 85% of the steam component is lost to evaporation in the WCT, a similar large amount of the original geofluids may NOT be available for re-injection. This confusion from the use of suspect terminology should be clarified.

The EIS should consider the environmental impacts from allowing WCTs when compared to systems relying upon air-cooled condensers ("ACCs"). The ACC systems would allow for 100% of the geofluids produced at a geothermal plant to be injected, because there are no evaporation losses of the original steam. By eliminating water loss through the WCTs, the geothermal resource can be better preserved, resulting in more sustainable production and minimizing impacts on available water sources.

If the WCT design facilities are evaluated, then the EIS needs to further consider and evaluate where the make-up water will originate and what impacts the use of such imported water will have on the region from which the make-up water is taken.

Particularly in arid areas, the importation of water from either surface water or surrounding Water Basins may have severe impacts upon the area from which the water is taken. Such water will no longer be available to preserve vegetation, natural habitats, riparian areas, and wetlands. Not only may the habitat suffer, but the wildlife which depends on such habitat may also be impacted.

The removal of water from the Rose Valley Basin may cause each and every property owner relying upon water wells to (a) increase the depth of their wells, (b) increase the capacity and efficiency of the wells, and/or (c) expend more energy to extract the depleted water supplies to the surface for reasonable use. Any drawdowns in the underground water levels may also cause the natural springs through the Rose Valley to go dry.

Land Use and Planning.

Studies of wildlife and existing habitat conditions are mandatory to determine whether the Project, if approved and implemented, may result in the elimination of viable wetlands, habitat and the like.

Noise.

The noise generated from the proposed project must be evaluated and considered. What are the noise levels and do they impact either the persons working at the project or the surrounding wildlife?

Utilities and Service Systems.

The disposal of wastewater and the emissions to the atmosphere from its cooling operations need to be studied carefully to determine whether they do present a hazard to the public or unacceptable levels of pollution.

Project Alternatives.

The EIS will also consider alternatives to the proposed Project. The full range of the alternatives should be studied. At a minimum, the following alternatives should be considered:

1. Identify whether current geothermal technology could be used to better enhance the operations and allow the more efficient use of water resources.

2. How much capacity is appropriate to avoid the depletion of the resource?

3. Would a lower level of electricity generation allow for the geothermal resources to be extended indefinitely?

4. What is the natural recharge of the geothermal fluids on an annual basis? Should the consumption of these fluids be balanced against the natural recharge?

5. Depending upon available technology and the identification of the geothermal resources, what is the best generating facility?

6. Identify all potential alternate sources for water and describe the means by which such waters can be used at the geothermal facilities other than water from the Rose Valley underground aquifer.

7. Reclaimed effluent water flows from the Ridgecrest Treatment Plant, or other nearby facilities, which is already being done in other areas to preserve geothermal resources.

8. Water purchases from the City of Los Angeles Department of Water and Power ("DWP").

9. Reclamation of DWP's water losses from Haiwee Reservoir.

10. Use of surface or underground water from the Indian Wells water basin (while perhaps farther away, there may be fewer environmental impacts).

11. Construction of new water entrapment programs such as reservoirs to utilize available precipitation, snowmelt and rain waters.

12. Water purchases and deliveries from other sources?

13. Rather than relying solely upon water supplied by the Rose Valley, can a combination of one or more alternative sources of water be used to minimize the damage to the Rose Valley Basin?

14. What are the opportunities for conserving and recycling water?

15. Is there some other gas, substance or fluid other than water which may be efficiently used to transfer the heat to the electrical generators?

16. Are "best practices" being used to minimize and reduce water loss, allowing for greater reclamation of its geothermal fluids?

17. What type of geothermal generating plant is being considered to reduce damage to the environment and the use of scarce water resources?

Without a full consideration of alternative technologies, such as air-cooled mechanisms or other engineering designs to reduce the use of water and increase the amount of the geothermal fluids used for injection, the EIS cannot adequately study and comment upon appropriate and prudent steps to mitigate the depletion of water resources. The possible depletion of geothermal reservoirs, and any plans to import water from the surrounding surface and groundwater sources should be considered in all planning stages.

I am enclosing with this letter two (2) computer compact discs ("CDs") on which many of the letters and evidence we have submitted to the County and BLM have been copied. Attached is a list of the documents in the CDs. Each of the letters enclosed in the CDs raises substantial environmental issues in connection with the development of geothermal projects in and round Rose Valley. The CDs also contain letters presented to the County and BLM from numerous local conservation groups and individuals. While all of the letters and the related reference materials refer to the Coso Project, all of such materials are equally applicable to the Projects being studied by BLM. Accordingly, the ESI must fully evaluate the proposed environmental impacts from the Projects under consideration, including all of the evidence and comment letters contained in the enclosed CD(s).

Very truly yours,

ARNOLD, BLEUEL, LAROCHELLE,
MATHEWS & ZIRBEL, LLP

Gary D Arnold

Gary D. Arnold

GDA:jw
Enclosures

REFERENCES:

U.S. Geological Survey, Springs of California, by Gerald A. Waring, published in 1915.

Rockwell Report 1980: *"Geology and Hydrology Technical Report on the Coso Geothermal Study Area"* conducted by Rockwell International dated April, 1980.

The California Desert Conservation Area Plan 1980, as amended.

Environmental Impact Statement published in September, 1980 for the *"Proposed Leasing within the Coso Known Geothermal Reservoir Area"* (Parts 1-5).

Report entitled *"The Recharge Area for the Coso, California, Geothermal System,"* by Robert O. Fournier and J.M. Thompson, 1980.

Environmental Assessment of the Proposed California Energy Company Plan of Exploration, Federal Lease CA-11402, Coso KGRA, dated December 5, 1985.

Draft Environmental Assessment/Environmental Impact Report For The California Energy Company Proposed Plans of Utilization, Development and Disposal, dated February 1988.

California Energy Commission Proposed Decision regarding China Lake Joint Venture's Navy 2 Geothermal Project, dated December, 1988.

United States Department of the Interior, Biological Opinion for the Proposed Desert Tortoise Habitat, dated December 3, 1992.

The judicial decision rendered by the California Supreme Court entitled *"Laurel Heights Improvement Association of San Francisco, Inc. v. The Regents of the University of California"* (1993) 6 Cal.4th 112.

The judicial decision rendered by the California Court of Appeal entitled *"Stanislaus Natural Heritage Project v. County of Stanislaus"* (1996) 49 Cal.App. 4th 727.

City of Barstow, et al. v. Mojave Water Agency, et al., filed on August 21, 2000.

Habitat Plan: Upper Little Lake Ranch, Inc. Habitat Restoration and Enhancement Project, dated October 14, 2000 (Current through April 20, 2001).

Habitat Plan Update: Upper Little Lake Ranch Habitat Restoration and Enhancement Project, dated November 30, 2000.

"Steady-State Deformation of the Coso Range, East-Central California, Inferred from Satellite Radar Interferometry," by Charles W. Wicks 2001.

Inyo County General Plan-Goals, dated December, 2001.

Inyo County General Plan-Open Space Goals, dated December, 2001.

Inyo County General Plan-Public Safety, dated December, 2001.

Master's Thesis entitled *"The Hydrogeology of Rose Valley, Little Lake Ranch, Inyo County, California,"* by Charles M. Bauer, dated April, 2002.

Draft Initial Study and Mitigated Negative Declaration prepared in conjunction with the Upper Little Lake Ranch Habitat Restoration and Enhancement Project, dated April 4, 2002.

Report prepared by the U.S. General Accounting Office in 2004 called *"Information on the Navy's Geothermal Program."*

Final Environmental Impact Report Baseline, Purposes and Objectives to Coso Project.

Final Environmental Impact Report for the Upper Little Lake Ranch Habitat Restoration and Enhancement Project, dated February 2004.

Coso Basin 6-55: Rose Valley Ground Basin as per California's Groundwater Bulletin 118 dated February 27, 2004.

Rose Basin 6-56: California's Groundwater Bulletin 118, February 27, 2004.

"Analysis of Causes of Hydrologic Changes at Coso Hot Springs," by Robert R. Curry, Ph.D., dated March, 2004, revised April 1, 2004.

SEC Annual Report, Form 10-K, for Caithness Coso Funding Corp., for fiscal year ending December 31, 2004.

Geothermal Annual Report, 2005.

Geologica, 2005: Appendices A, B (Tables B1 and B2), C (Table C1), D (Tables D1, D2 and D3), E (Table E1), F1 (4H4 Steam Flow), F2 (Devils Kitchen Steam Flow).

Biological Survey, Hay Ranch Water Extraction and Delivery System, prepared by Ultra Systems for Coso Operating Company, LLC, dated March, 2005.

Cultural Resources Inventory for the Hay Ranch Water Extraction and Delivery System, Coso Geothermal Project, Inyo County, California, dated May, 2005, prepared by ASM Affiliates, Inc. for Coso Operating Company, LLC.

Progress Report for Year Ending December 31, 2006: Creation of an Enhanced Geothermal System through Hydraulic and Thermal Stimulation, Peter Rosel, Principal Investigator; Open Meeting on Enhanced Geothermal System, Summary Report, Reno Nevada, September 26-27, 2002; Geothermal Today, U.S. Department of Energy, 2003 Geothermal Technologies Program Highlights.

Pollution Workplan 2008: Pollution Prevention Report and Two-Year Workplan for 2006-2008, California Environmental Protection Agency.

MIT Report: *"The Future of Geothermal Energy, Impact of Enhanced Geothermal Systems (EGS) on the United States in the 21st Century,"* 2006.

Geothermal Sustainability 2006: Article in GRC Transactions, Vol. 30, 2006, by L. Rybach and M. Mongillo.

Annual Report of Geothermal, Oil & Gas, published by California Department of Oil, Gas and Geothermal 2006.

Report of the licenses held by Daniel Wilson Matthews from the website for the California Board of Geologists and Geophysicists.

Report of the licenses held by Varinder Singh Oberoi from the website for the California Board for Professional Engineers and Land Surveyors.

Rose Valley Groundwater Model dated April 10, 2006, prepared for Coso Operating Company, LLC by Brown and Caldwell.

Hydrologic Analysis of the Coso Geothermal System: Non-Technical Summary dated April 26, 2006, prepared by Innovative Technical Solutions, Inc.

Final Draft Environmental Assessment, Hay Ranch Water Extraction and Delivery System, published in May, 2006, for Bureau of Land Management.

Coso Hot Springs Final Monitoring Report, dated August, 2006, prepared by Geologica.

Geologica, 2006: Appendices A, B (Tables B1 and B2), C (Table C1), D (Tables D1, D2 and D3-5), E and F.

Geologica, 2006: Figures 1-3, 4, 5, 6, 7, 8, 12-23, 24, 25, 26, 27.

Memorandum from the County of Inyo Water Department to the Inyo County Water Commission, dated September 29, 2006.

Inyo County Water Commission Meeting Minutes of October 5, 2006.

E-mail from Gary Arnold to Jan Larsen dated December 22, 2006 requesting that all notices involving the appeal filed by Little Lake Ranch, Inc. from the approval of the Planning Commission on the Coso Hay Ranch Project be sent to him.

The California Court of Appeal decision entitled "*Communities for a Better Environment v. South Coast Air Quality Management Dist.*" (2007) 158 Cal.App.4th 1336.

Letter dated January 31, 2007 from Gary Arnold to Inyo County Board of Supervisors.

Letter dated February 5, 2007 from Herb Simmons, P.E., of Provost & Pritchard to Inyo County Board of Supervisors.

Letter dated February 5, 2007 from Gary Arnold to Inyo County Board of Supervisors.

Coso-Little Lake Mitigation Measure, March 5, 2007.

The Owens Valley Committee article entitled *"Desertification as usual: groundwater management under the Inyo-LA Long Term Water Agreement,"* dated March 6, 2007.

E-mail dated March 6, 2007 from Greg James to Gary Arnold regarding draft revised Mitigation Measure.

E-mail dated March 8, 2007 from Gary Arnold to Greg James regarding Mitigation Plan.

E-mail dated March 8, 2007 from Greg James to Gary Arnold regarding Coso Mitigation Measure.

Memorandum dated March 8, 2007 from Greg James to Gary Arnold regarding revised mitigation.

California Environmental Law Reporter article dated March, 2008, entitled *"The Recent Re-Emergence of CEQA's Substantive Mandate,"* by Douglas P. Carstens and Arthur Pugsley.

Redlined Mitigation Measures, March 8, 2007 (Coso).

CUP Conditions, March 28, 2007.

E-mail from Gary Arnold to Randy Keller dated April 3, 2007 regarding Mitigation Plan.

Letter dated April 17, 2007 from Gary Arnold to Inyo County Board of Supervisors.

Letter dated April 23, 2007 from Gary Arnold to Inyo County Board of Supervisors.

Coso Hot Springs Monitoring Report, 2005-2006, Naval Air Weapons Station, Geothermal Program Office, China Lake, CA, dated May, 2007.

Coso Hot Springs Monitoring Report, 2005-2006, Naval Air Weapons Station, Geothermal Program Office, China Lake, CA, dated May, 2007 (Figures 1-27).

Memorandum dated June 14, 2007 from Gary Arnold to Randy Keller regarding settlement.

Letter dated July 20, 2007 from Gary Arnold to Hector Villalobos, Bureau of Land Management.

E-mail from Jan Larsen to Laurie McClenahan Hietter of MHA dated September 26, 2007.

Letter dated October 22, 2007 from Gary Arnold to Inyo County Planning Department.

Letter dated October 22, 2007 from the Native American Heritage Commission to Inyo County Planning Department.

Meeting notes from meeting dated October 22, 2007 among Inyo County staff and the EIR consultant, MHA/RMT.

Letter dated October 29, 2007 from California Regional Water Quality Control Board, Lahontan Region, to Inyo County Planning Department.

Memorandum dated October 29, 2007 from Geologica to Inyo County Planning Department discussing the proposed pumping tests.

Letter dated October 30, 2007 from Mike Prather, former Chairman of the Owens Valley Committee received by Inyo County Planning Department.

Letter dated November 1, 2007 from Los Angeles Department of Water and Power to Inyo County Water Department.

Letter dated November 2, 2007 from Carla Scheidlinger, President of Owens Valley Committee, to Inyo County Planning Department.

Letter dated November 6, 2007 from Bishop Tribal Counsel to Inyo County Planning Department.

E-mail dated November 9, 2007 between Steven Bjornstad with U.S. Navy and Chrissy Spanoghe, a consultant with MHA, or its parent RMT, regarding Hay Ranch: Access to Coso Hot Springs.

A letter from MHA to the Inyo County Planning Department dated November 29, 2007.

California Court of Appeal decision entitled *"Save Round Valley Alliance v. County of Inyo,"* filed December 17, 2007.

Coso Reservoir Model 12-20-07: A document apparently received by Inyo County Planning Department from Coso on December 20, 2007, and contained in the Inyo County Planning Department files.

Draft memo apparently received by the ICPD on December 20, 2007, and contained in the Inyo County Planning Department files.

Fitch Ratings, Coso Geothermal Power Holdings, LLC, dated December 21, 2007.

Annual Report of Geothermal, Oil & Gas, published by California Department of Oil, Gas and Geothermal 2008.

"Geothermal Power Plants: Principles, Applications, Case Studies and Environmental Impact," Second Edition, copyright 2008 Elsevier, Ltd., by Ronald DiPippo, Ph.D.

E-mail from Sean Haggerty of BLM to Kermit Witherbee, dated February 27, 2008.

Copy of an agenda for a conference call, with a fax date stamp on the agenda of April 30, 2008 contained in the Inyo County Planning Department files.

Programmatic Environmental Impact Statement for Geothermal Leasing in the Western United States prepared by Bureau of Land Management and the United States Forest Service, May, 2008.

CSLC Permit Extension 5-1-08: Extension of the Deep Rose Geothermal Exploration Permit issued by the California State Lands Commission, effective May 1, 2008.

Article appearing in Wikipedia, the free encyclopedia, entitled Cooling Towers dated June 20, 2008.

Letter dated June 20, 2008 from Gary Arnold to Geothermal PEIS.

Letter dated June 30, 2008 from Gary Arnold to Geothermal PEIS.

Memorandum dated August 13, 2008 from Andrew Zdon, P.G., C.E.G., C.Hg., associated with Golden State Environmental, Inc., regarding preliminary comments concerning Coso Operating Company Hay Ranch Water Extraction and Delivery System, Draft Environmental Impact Report.

Curriculum Vitae of Andrew Zdon, P.G., C.E.G., C.Hg.

Curriculum Vitae of Ronald DiPippo, Ph.D.

Letter dated August 14, 2008 to the Inyo County Planning Department from Ronald DiPippo, Ph.D.

Inyo County Coso/Hay Ranch DEIR comments by Ronald DiPippo, Ph.D., dated August 14, 2008.

Letter dated August 22, 2008 from Gary Arnold to Tanda Gretz, Inyo County Planning Department.

Letter from Ducks Unlimited, dated August 29, 2008, to the Inyo County Planning Department.

Memorandum dated September 2, 2008 from Andrew Zdon, P.G., C.E.G., C.Hg., associated with Golden State Environmental, Inc., regarding comments concerning Coso Operating Company Hay Ranch Water Extraction and Delivery System, Draft Environmental Impact Report

Letter dated September 3, 2008 from Gary Arnold to Tanda Gretz, Inyo County Planning Department.

Coso Operating Company Hay Ranch Water Extraction and Delivery System Final EIR dated December, 2008 (coversheet).

Coso Operating Company Hay Ranch Water Extraction and Delivery System Final EIR (Table of Contents).

Coso Operating Company Hay Ranch Water Extraction and Delivery System Final EIR (Chapter 1).

Coso Operating Company Hay Ranch Water Extraction and Delivery System Final EIR (Chapter 2).

Coso Operating Company Hay Ranch Water Extraction and Delivery System Final EIR (Chapter 3).

E-mail from Charles Harris to Gary Arnold, dated September 2, 2008.

Memorandum from Andrew Zdon, P.G., C.E.G., C.Hg., associated with Golden State Environmental, Inc., to Gary Arnold and Walt Puchucki dated September 2, 2008.

Coso Operating Company Hay Ranch Water Extraction and Delivery System Final EIR (Appendix 1).

Fitch Ratings press release dated October 22, 2008, entitled *"Fitch Affirms Coso Geothermal Power Holdings, LLC at 'BBB'; Outlook Stable."*

Letter dated January 7, 2009 from Gary Arnold to Inyo County Water Commission.

Letter dated January 8, 2009 from Gary Arnold to Inyo County Water Commission.

Memorandum dated January 9, 2009 from Andrew Zdon, P.G., C.E.G., C.Hg., associated with Golden State Environmental, Inc., regarding comments concerning Coso Operating Company Hay Ranch Water Extraction and Delivery System, Draft Environmental Impact Report

Memorandum dated January 14, 2009 from Andrew Zdon, P.G., C.E.G., C.Hg., associated with Golden State Environmental, Inc., regarding comments concerning Coso Operating Company Hay Ranch Water Extraction and Delivery System, Meeting Comments.

Letter dated January 15, 2009 from Gary Arnold to Inyo County Water Commission.

Letter dated January 22, 2009 from Gary Arnold to Inyo County Water Commission.

Memorandum dated January 22, 2009 from Gary Arnold to Inyo County Water Commission regarding FEIR quotes and replies.

Letter dated January 22, 2009 from Daniel Pritchett to Inyo County Water Commission.

Memorandum dated January 28, 2009 from Inyo County Water Commission to Inyo County Planning Commission regarding recommendations concerning Coso Water Project.

Letter dated January 29, 2009 from Andrew Zdon, P.G., C.E.G., C.Hg., associated with The Source Group, Inc., regarding Supplemental Comments, Hay Ranch Extraction Project.

Air-Cooled Geothermal Power Plants prepared by Ronald DiPippo, Ph.D., dated February, 2009.

Letter dated February 9, 2009 from Gary Arnold to Inyo County Planning Commission.

Letter dated February 20, 2009 from Rex Allen to Inyo County Planning Commission.

Letter dated March 4, 2009 from President, Bristlecone Chapter, California Native Plant Society.

Letter dated March 4, 2009 from Gary Arnold to Inyo County Planning Department.

Inserts to letter dated March 4, 2009 from Gary Arnold to Inyo County Planning Department.

Letter dated March 4, 2009 to Randy H. Keller, Assistant County Counsel, from Gary Arnold.

Letter dated March 5, 2009 from Andrew Zdon, P.G., C.E.G., C.Hg., associated with The Source Group, Inc., regarding Supplemental Comments on Inyo County Staff Recommendation to Planning Commission, Hay Ranch Water Extraction Project.

Letter dated March 8, 2009 from Sara J. Manning, Ph.D. to Inyo County Planning Commission.

Letter dated March 9, 2009 from Gregory S. Yarris, California Waterfowl, to Inyo County Planning Commission.

Report on Power Engineers by Ronald DiPippo, Ph.D., dated March 16, 2009.

Letter dated March 20, 2009 to Randy H. Keller, Assistant County Counsel, from Gary Arnold.

Letter dated April 10, 2009 from Gary Arnold to Inyo County Board of Supervisors regarding Coso Water Project.

The News Review Article dated April 10, 2009, written by Carl Fulton, Austin, Ph.D., entitled *"Care and feeding of a geothermal reservoir,"* and curriculum vitae.

Associated Press article dated April 18, 2009, *"Desert clash in West over solar potential, water."*

Letter dated April 30, 2009 from Gary Arnold to Inyo County Board of Supervisors regarding Coso Water Project.

Letter dated May 4, 2009 from California Waterfowl to Inyo County Board of Supervisors.

Letter dated May 5, 2009 from Sara J. Manning, Ph.D. to Inyo County Board of Supervisors.

Approved Mojave Ground Squirrel Mitigation Plan.

Curriculum Vitae of Jill R. Haizlip, M.S. according to the public website for Geologica, Inc.

Curriculum Vitae of Brian F. Aubry, R.G., C.E.G., C.Hg.

Coso Geothermal Study Area Map.

Article entitled *"Owens Valley, California, Plant Ecology: Effects from Export Groundwater Pumping and Measures to Conserve the Local Environment,"* by David P. Groeneveld, Inyo County Water Department.

A pictorial and narrative history of Little Lake Ranch, including its creation, predecessors and significant events, by Richard H. Nueman, M.D.

A report by Jim Pearson, Ph.D. of the historical events in and around Little Lake.

Curriculum Vitae of Jim Pearson, Ph.D.

Brief description of locations and uses of water well on the Little Lake Ranch property.

Chamber Report of Commerce report of largest employers in Ridgecrest.

ARNOLD BLEUEL
LAROCHELLE MATHEWS &
ZIRBEL LLP
ATTORNEYS AT LAW

GARY D. ARNOLD
BARTLEY S. BLEUEL*
DENNIS LAROCHELLE
JOHN M. MATHEWS
MARK A. ZIRBEL
KENDALL A. VAN CONAS*
SUSAN L MCCARTHY
AMBER A. EISENBREY
STUART G. NIELSON
ROBERT S. KRIMMER

OF COUNSEL
MATTHEW P. GUASCO

300 ESPLANADE DRIVE, SUITE 2100
OXNARD, CALIFORNIA 93036
TELEPHONE: 805.988.9886
FAX: 805.988.1937
www.atozlaw.com

Writer's e-mail
garnold@atozlaw.com

09 OCT -2 AM 10:53

September 30, 2009

John Dalton, Haiwee Geothermal Leasing Coordinator
Bureau of Land Management
California Desert District Office
22835 Calle San Juan De Los Lagos
Marino Valley, CA 92553

Re: Haiwee Geothermal Projects

Dear Mr. Dalton:

Please accept this letter as my request on behalf of Little Lake Ranch, Inc. ("LLR") to receive written notice of any hearings, actions, decisions, meetings, studies, applications or procedures concerning and relating to the pending geothermal exploration and development projects located within the Haiwee area near Ridgecrest and Inyo County, California ("Project"). LLR owns approximately 1,200 acres southwest of the proposed Project, including Little Lake and the riparian areas adjacent thereto. To the extent that the Project contemplates the use of water pumped from the Rose Valley in which LLR is also located, the Project could have severe impacts upon LLR.

I am enclosing a copy of a letter I am directing to BLM in Ridgecrest asking for the production of public records in connection with the Project. I am not sure if such request should be directed to you or the Ridgecrest Office. Please advise. Thank you for your attention to the foregoing.

Very truly yours,

ARNOLD, BLEUEL, LAROCHELLE,
MATHEWS & ZIRBEL, LLP

Gary D Arnold

Gary D. Arnold

GDA:jw
Enclosure
cc: Little Lake Ranch
Hector Villalobos

Little Lake\BLM\BLM Ltr-Notice

* Certified Specialist, Estate Planning, Trust and Probate Law State Bar of California Board of Legal Specialization

ARNOLD BLEUEL
LAROCHELLE MATHEWS &
ZIRBEL LLP
ATTORNEYS AT LAW

GARY D. ARNOLD
BARTLEY S. BLEUEL*
DENNIS LAROCHELLE
JOHN M. MATHEWS
MARK A. ZIRBEL
KENDALL A. VAN CONAS*
SUSAN L MCCARTHY
AMBER A. EISENBREY
STUART G. NIELSON
ROBERT S. KRIMMER

OF COUNSEL
MATTHEW P. GUASCO

300 ESPLANADE DRIVE, SUITE 2100
OXNARD, CALIFORNIA 93036
TELEPHONE: 805.988.9886
FAX: 805.988.1937
www.atozlaw.com

Writer's e-mail
garnold@atozlaw.com

September 30, 2009

U.S. Department of Interior
Bureau of Land Management
Attn: Custodian of Records
300 S. Richmond Road
Ridgecrest, CA 93555

RE: PUBLIC RECORDS REQUEST

To: Custodian of Records

Please provide to the undersigned any and all records and other public documents relating to the pending geothermal exploration and development projects located within the Haiwee area near Ridgecrest and Inyo County, California ("Project"). Such requested records include all documents related to the Project, including, but not limited to, any and all reports, studies, notices, applications, correspondence, memorandums, e-mails, notes during environmental documents, initial studies, permits, licenses, approvals and other writing involving or concerning the Project.

This request is made pursuant to the Freedom of Information Act, U.S.C. §552. Authorized fees will be paid to you pursuant to an itemized invoice. I am sending a duplicate copy of this letter to John Dalton, who is the Haiwee Geothermal Leasing Coordinator for the Project.

Please contact the undersigned should you have any questions or require any additional information.

Very truly yours,

ARNOLD, BLEUEL, LAROCHELLE,
MATHEWS & ZIRBEL, LLP

Gary D Arnold

Gary D. Arnold

GDA:jw
cc: John Dalton
Little Lake Ranch
Little Lake\BLM\BLM Ltr-Records

* Certified Specialist, Estate Planning, Trust and Probate Law State Bar of California Board of Legal Specialization

BIG PINE PAIUTE TRIBE OF THE OWENS VALLEY
Big Pine Indian Reservation

November 19, 2009

John Dalton
Haiwee Geothermal Leasing Coordinator
BLM California Desert District Office
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Dear Mr. Dalton,

Subject: Comments on Proposed Haiwee Geothermal Leasing Area

The Big Pine Paiute Tribe of the Owens Valley (Tribe), a federally recognized Tribe, thanks you for the opportunity to submit comments during this scoping phase for the proposed leasing of BLM land in Rose Valley for geothermal exploration and development.

Proposed Project

The Proposed Action is: Amend the California Desert Conservation Area (CDCA) Plan to either open or close the 22,000 acre Haiwee Geothermal Lease Area (HGLA) to geothermal exploration, development and utilization. The CDCA Plan was completed in 1980, but has been amended several times since then. The plan recognizes prime areas for geothermal as being in Imperial County and in the Coso Known Geothermal Resource Area (KGRA). It is unclear from the maps and materials that have been presented if the HGLA overlaps with the Coso KGRA, but the fact that the CDCA Plan would require amendment suggests minimal to no overlap. The EIS should disclose the reason for not considering the HGLA previously and for not including it with the Coso KGRA. All previous management designations assigned for the Rose Valley area according to the CDCA will require critical scrutiny in this environmental review.

The CDCA Plan defines a Native American Element, and with regard to this element, the goals were to remain consistent with governing policies and:
1) Identify Native American values through regular contact and consultation with Tribal entities and/or individuals,
2) give *full consideration* to native American values in land use planning and management decisions [italics added for emphasis], and
3) protect and manage Native American values wherever prudent and feasible.
The CDCA Plan acknowledges -- and we concur -- that impacts affecting Native American values are not amenable to mitigation, because these impacts typically involve desecration or sacrilegious treatment of spiritually important sites.

P.O. Box 700 • 825 South Main Street • Big Pine, CA 93513 • Office: (760) 938-2003 • Fax: (760) 938-2942

Tribal Consultation Process

The Tribe is very concerned about the recent lack of timely notification about projects on which BLM has been the lead agency. BLM has initiated environmental review on a number of proposals to develop or consider development of renewable energy throughout the southwest region, and the Tribe has received notices either late in the process or not at all. We respectfully request initiation of the Consultation process before or no later than the start of the public Scoping process. Doing so should ensure both parties comply with the provisions and responsibilities of Section 106 of the National Historic Preservation Act.

Concerning this project in particular, we did not receive notification until the Scoping period was well underway, and although there were meetings scheduled for the nearby communities of Lone Pine and Bishop, we were notified less than one week before these scheduled meetings. BLM had initially informed us that the deadline for comments was October 16. Near that date, the deadline was changed to November 9. Subsequently, the Tribe was invited to submit comments with regard to the Consultation process no later than November 20. It's still not clear to us why there are two due dates, but by phone on November 6, you advised we could submit one comprehensive set of comments by November 20.

Prehistoric and Native American Resources/Need for Cultural Inventory

When BLM and its archaeological consultants survey for cultural resources for this EIS, we request that a Native American Monitor be present.

Geothermal Energy: A Tradeoff

The Tribe in concept favors efforts to reduce dependence on fossil fuels and employ cleaner alternatives when feasible. However, we believe that, for many situations energy conservation measures may serve to reduce both reliance on foreign energy sources and greenhouse gas emissions, thereby precluding the need to increase power generating capacity. All energy development involves tradeoffs; thus we urge BLM to carefully examine those tradeoffs when deciding whether to open the Haiwee area for geothermal exploration and possible development. Geothermal plants typically do emit some of earth's sequestered carbon dioxide into the atmosphere, and geothermal sources do not last forever. The true renewability of earth's heat is not well understood. New power plants require transmission lines, and they establish their own footprint with procurement and waste streams. Power plant operators typically discourage or prohibit access to their facilities, and denial of access may conflict with a Native American value. Finally, geothermal energy production involves water, and water in our desert area is precious. Extraction of water from this arid region could alter a spring and kill or diminish the life forms that depend on that water, and the loss of such habitats is permanent. Therefore, we urge the BLM to constantly assess the tradeoffs. For example, is providing energy for streetlights in a shopping center a good reason to threaten a spring?

Review of Record for Coso Hay Ranch Project

The Tribe raised serious concerns over the proposal by Coso Operating Company to pump relatively large amounts of water from Rose Valley and pipe it to their power generating facility located within the China Lake Naval Air Weapons Station. The project was generally opposed not only by tribes, but also by local land owners (such as the owners of Little Lake Ranch), environmental groups, the Inyo County Water commission, and the Los Angeles Department of Water and Power (LADWP). We recommend BLM review the BLM EIS, the

Inyo County EIR, and all concerns raised about the Hay Ranch project. It should be noted, for example, that pumping at Coso Hay Ranch could seriously impact water availability in the aquifer beneath Rose Valley. Also, LADWP has announced plans to pump water for export from the Rose Valley aquifer. Such ongoing and anticipated activities could seriously confound geothermal development in the vicinity. The voluminous information generated as a result of the Hay Ranch proposal can benefit BLM with regard to assessing impacts to the HGLA, but it may also show that further development in the region will not be feasible.

Thorough Inventory/ Cumulative Effects

The NEPA process must involve thorough inventory and characterization of wetlands (all springs and seeps) and regional hydrology, vegetation, wildlife, rare plant and animal species, geology, aesthetic/scenic values, recreation, and dust generation. Because other large-scale operations occur in the vicinity (LADWP operations, Owens Lake dust mitigation, pumping for export by Coso Hay Ranch, livestock grazing, and others), BLM must analyze each environmental element in terms of cumulative effects imposed by a new project.

Final Comments

If BLM decides to allow leasing for geothermal exploration and development, there will be impacts. We understand further environmental review will occur prior to building power plants. Regardless, tradeoffs need to be carefully examined. Priorities should be to avoid any impacts to Native American values, as well as to avoid as many adverse environmental impacts as possible. Secondly, resource impacts should be minimized if they are deemed necessary and steps should be taken as soon as possible to restore areas. Mitigation plans should be in place to compensate for the lost resources, goods, services, and values. The Tribe recommends a fund for mitigation be established for each developed site and that considerable thought be given to the real cost of mitigating long-term and currently unquantifiable impacts such development will cause. Finally, before geothermal is implemented, BLM should perform a thorough evaluation of royalties.

Sincerely,

Virgil Moose

Virgil Moose
Tribal Chairperson

"Tom Budlong" <TomBudlong@RoadRunner.com>

11/06/2009 08:05 AM

To <John_Dalton@ca.blm.gov>

cc

bcc

Subject Haiwee

John,

Attached, comments on the Haiwee Geothermal Leasing.

I'm also mailing a copy.

Regards,

Tom Budlong

Comments on Haiwee Geothermal.doc

Tom Budlong
3216 Mandeville
Los Angeles, CA 90049

Friday, November 6, 2009

John Dalton
Haiwee Geothermal Leasing
Bureau of Land Management, CDD
22835 Calle San Juan de los Lagos
Moreno Valley, CA 92553

By email to John_Dalton@ca.blm.gov
By Certified Mail, Article No. 7008 2810 0000 5936 1316

Dear Mr. Dalton,

I attended the Scoping Meeting at the Kerr McGee Center in Ridgecrest on October 15, 2009 for possible leasing in the Haiwee Geothermal Leasing Area. The Fact Sheet handed out at the meeting states BLM must make two decisions:

- Whether to approve three noncompetitive lease applications for approximately 4500 acres of BLM lands in the leasing area. [The lessee, as explained at the meeting, is Deep Rose.]
- Whether to offer competitive leases in the leasing area.

This letter is in response to requests for comments.

1) On Nov. 4, I talked with Sean Hagerty who explained the rights associated with leasing: As mentioned in the Sep 11, 2009 Federal Register notice, areas leased under the process that includes this EIS have rights to three "phases" -- exploration, development and utilization. The BLM can lease without these rights by including a 'No Surface Occupancy' stipulation in the lease. Without the 'No Surface Occupancy' in the lease, the BLM cannot deny development after exploration without risking potentially substantial liability. Mr. Hagerty also explained that the BLM can, however, require development be located somewhere on the lease that is not the lessee's choice.

Thus, the EIS must do enough analysis to identify all locations in the lease area that would be acceptable for exploration, development and utilization, locations which would not be acceptable exploration, development and utilization, and locations which could be leased under No Surface Occupancy. I presume the BLM could also remove some areas from all consideration in favor of analyzing them in the future, to reduce the immediate analysis burden.

Presenters at the meeting stated that for analysis purposes the production facility would be assumed to be 2 ea 30MW plants. The EIS should analyze this configuration. If it is anticipated that lessees would prefer other configurations, those configurations should also be analyzed. The EIS should not allow leasing for configurations not analyzed.

2) With respect to the Deep Rose noncompetitive leases:

There is a reasonable question about the financial and technical capability of the Deep Rose venture:

- The applicant, Deep Rose, is proposing drilling to 18-20,000 feet. This is on the order of twice the depth of the nearby Coso Geothermal facility. This was discussed at the meeting. Deep Rose has a leasing permit for the State section 16, within the leasing area boundary, and this depth has been their intention there.
- This is abnormally deep for geothermal facilities.
- Drilling to this depth is extraordinarily expensive. In analyzing the economic risk, the EIS should describe and analyze the financial strength of Deep Rose to determine its adequacy.

- Coso Geothermal, with a proven track record and presumably with extensive knowledge of the resource, has not shown interest in this depth. This pre-drilling exploration is considered prudent when considering geothermal energy extraction, to avoid unnecessary drilling expense and unnecessary degradation of environmental values.
- Deep Rose has no geothermal technical, exploration or development experience.
- It is apparent that Deep Rose has not demonstrated or indicated it has performed systematic pre-drilling exploration.

The Deep Rose exploration should be considered experimental and speculative:

- It is outside normal experience for geothermal energy extraction.
- Deep Rose does not have geothermal development experience.
- Normal exploration prior to drilling apparently has not been done.

To avoid unnecessary disturbance and degradation of public land for such a project the EIS should require that Deep Rose perform prudent pre-drilling exploration common to professional geothermal projects.

The EIS should carefully and realistically review the pre-drilling exploration data to ensure:

- that the probability of completion of the Deep Rose exploration warrants approving the exploration.
- that the probability of discovering an economic resource if the exploration is completed warrants exploration.

Coso Geothermal recently was permitted to use aquifer water for wet cooling to restore production at their facility, instead of converting to dry cooling. The documents leading to this permit include expert opinions with two opposing views. One (Coso Geothermal) concluded that conversion to dry cooling would be impractical. The other (Ronald DiPippo) concluded the opposite. This emphasizes that geothermal design is not a simple science, and that a single feasibility opinion is insufficient. Because of the experimental nature of the project and the complexity of the science and engineering, the EIS process should consult with more than one expert in the field, and include all opinions. The BLM should strongly consider creating a panel of expert geothermal consultants whose members could work together to examine the technical aspects of the project to arrive at consensus, or document lack of consensus.

3) The EIS should describe:

- The source and projected amount of water to support the three phases – exploration, development and utilization.
- The source of water and projected usage rate of possible plant designs for cooling, for production and injection well losses, for losses from other related activities, and for parasitic requirements. Of particular concern is the cooling method, wet, dry or hybrid, projected for a production plant, and whether a plant would expect to draw on aquifer water.

These concerns arise from concerns of ground water extraction by the existing Coso Geothermal operations. The cumulative impact of extraction by Coso Geothermal, Deep Rose, and additional lessees that would be allowed must be analyzed.

4) The EIS should analyze the amount of geothermal related activity the lease area could support.

5) The EIS should describe reclamation on completion of the three phases – exploration, production and utilization. This should include

- Extent to which the property must be returned to undisturbed condition.
- The time allowed for the phases. These periods cannot be open-ended, since that provides a path to delay restoration.
- The time allowed for reclamation after a phase is completed or its time has expired.

- Reclamation bond amounts and conditions.

6) The Federal Register Notice of Sep 11, 2009 lists issues identified thus far, and are included here by reference to the notice. These are:

- Native American concerns
- Land use conflicts, including recreation
- Cumulative impacts considering existing, proposed and potential geothermal projects in the area. (These should include other projects besides geothermal, and not be limited to the boundaries of the leasing area.)
- Potential impacts on:
  - Cultural resources. At the meeting, Don Storm, the BLM archaeologist, described very sensitive prehistoric resources in the area, and some historic resources.
  - Social and economic issues
  - Wildlife. This should include animals and insects.
  - Visual resources. This includes California Watchable Wildlife's Little Lake Overlook.
  - Surface water.
  - Ground water. (See earlier comments in this letter).
  - Geology, including the potential for subsidence and for triggering earthquakes.
  - Mining.
  - Effect on Coso Geothermal.
  - Effect on surface expressions of this geothermal resource.
  - Vegetation
  - T & E species
  - Air quality
  - Noise
  - Transportation
  - Human health and safety

7) The EIS should analyze effects on greenhouse gasses and global warming.

8) The EIS should analyze the ability and capacity for BLM to manage and monitor the activity without impacting its other responsibilities.

9) Native Americans

Native American tribes should be actively solicited for comments. Due to potential cultural differences, this should include active solicitation involving personal contact (phone and face-to-face) encouraging participation, as well as formal notices by mail, email and other methods. My understanding is that this area is generally the intersection of the territory of more than one tribe. An archaeologist should be consulted to determine the tribe or tribes of interest, and an archaeologist should be involved in collecting and analyzing comments, again due to cultural differences.

Sincerely,

Tom Budlong
310-476-1731 Voice
310-471-7531 Fax
TomBudlong@RoadRunner.com

California Native Plant Society

Bristlecone Chapter
P.O. Box 364
Bishop, CA 93515

October 13, 2009

John Dalton
Haiwee Geothermal Leasing Coordinator
22835 Calle San Juan de Los Lagos
Moreno Valley,CA 92553

Re: Proposed Geothermal Project in Haiwee Area (*re*: News Release No. CA-CDD-09-69)

"Here is an inconvenient truth about renewable energy: It can sometimes demand a huge amount of water." New York Times, September 30, 2009

Dear Mr. Dalton:

I wish to list some concerns of The Bristlecone Chapter of the California Native Plant Society regarding additional development of geothermal resources in Inyo County. Neither the chapter nor the state organization are opposed to "renewable" energy development, provided such projects are truly renewable and do not have significant direct or indirect effects on critical habitats or rare species of plants in California. Geothermal plants tend to have a small footprint and potentially adverse direct effects should be avoidable with proper citing of facilities. We are more concerned about the indirect effects, which generally involve non-renewable, consumptive uses of water leading to the degradation of wetland habitats. There is increasing national awareness and concern over inappropriate water use in "renewable" energy projects, as evidenced by the recent article in the *New York Times*, cited above.

The existing Coso Geothermal Plant is an excellent example of the problem. The methods of operation this plant, which involve wet-cooling towers, have resulted in a serious depletion of the geothermal fluids resulting in a decline in the production of electrical power. Inyo County recently approved export of the entire annual recharge of the Rose Valley aquifer to restore the capacity of the plant. According to the EIR for the water export, this level of water diversion will destroy significant wetland habitat for plants and animals in the vicinity of Little Lake, unless the "Hydrological Monitoring and Mitigation Plan" (HMMP) is fully and faithfully implemented by both Coso Operating Company and Inyo County. Implementation of the HMMP is not assured, however. As far as I know, the need for water extraction and export was never addressed in the original environmental assessment of the Coso Geothermal Plant. CNPS believes that it is crucial that we apply lessons from the past to any future geothermal projects.

Specifically,

- Applicants for any new geothermal projects in the Haiwee-Coso area should be required to explicitly address in the EIR whether or not their projects will deplete the geothermal resource through their cooling systems, and whether injection of surface water or groundwater will be required over the life of the proposed project. If applicants state that appropriation of water resources will not be part of the project, that condition should be incorporated into the terms of the lease or license.

- If applicants state that appropriation of surface waters or groundwater either will or may become necessary, then the EIR for the project should specifically address (a) the source of the appropriated water, and (b) all impacts associated with such water appropriation, including potential impacts on all wetland habitats maintained by the appropriated water source. Analysis of such impacts should include detailed biological surveys of the affected wetland habitats—this was never done in the case of the Coso Geothermal Company's water exportation project.

In evaluating applications for new geothermal projects in the Haiwee-Coso area, please keep in mind that the entire annual recharge of the Rose Valley aquifer has already been appropriated by the Coso Operating Company, with the approval of Inyo County. Additional water from Rose Valley can therefore only come from groundwater mining, which will accelerate the degradation of wetlands in the area.

Sincerely,

Steven P McLaughlin

Steven P. McLaughlin,
President, Bristlecone Chapter, CNPS

Cc: Greg Suba, Conservation Program Director, CNPS

CENTER *for* BIOLOGICAL DIVERSITY

VIA U.S. MAIL AND ELECTRONIC MAIL

November 9, 2009

Bureau of Land Management
California Desert District Office
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
John_Dalton@ca.blm.gov

Attn: John Dalton, Haiwee Geothermal Leasing Coordinator

Re: Notice of Intent To Prepare an Environmental Impact Statement for the Proposed Leasing of National System of Public Lands for Geothermal Resource Development in the Haiwee Geothermal Leasing Area Located in Inyo County, CA and To Amend the California Desert Conservation Area Plan of 1980

Dear Mr. Dalton

The Center for Biological Diversity ("Center") is a non-profit environmental organization dedicated to the protection of native species and their habitats through science, policy, and environmental law. The Center has over 40,000 members throughout California and the western United States, including members that live and/or visit the vicinity of the proposed Haiwee Geothermal Leasing Area. These scoping comments are submitted on behalf of our board, staff and members.

The development of renewable energy generation and adequate transmission capacity for that renewable energy is a critical component of efforts to reduce greenhouse gas emissions, avoid the worst consequences of global warming, and to assist California in meeting emission reductions standards. The Center strongly supports the development of renewable energy production, and supports the generation of electricity from geothermal power, in particular, and truly necessary transmission upgrades to support that power production. However, like any project, proposed geothermal power projects must be thoughtfully planned to minimize impacts to the environment. In particular, renewable energy projects should avoid impacts to sensitive species and habitats to the greatest extent possible through careful siting, planning, and design. Only by maintaining the highest environmental standards with regard to local impacts, and effects on species and habitats, can renewable energy production be truly sustainable.

The DEIS must include a hard look at impacts to all imperiled species in this area including direct, indirect and cumulative impacts across the species' range. Of particular concern are impact to the Mojave ground squirrel and the conservation area set aside for its

Lisa T. Belenky ·Senior Attorney · 351 California St., Suite 600 ·San Francisco, CA 94104
tel: (415) 436.9682 ext. 307 *fax:* (415) 436.9683 lbelenky@biologicaldiversity.org *www.BiologicalDiversity.org*

recovery which the proposed project directly impacts. Wildlife habitat through out this area of the California desert is becoming increasingly fragmented and subject to multiple development pressures. As a result, the cumulative analysis must be particularly robust in order to ensure both the survival and recovery of imperiled species.

Of particular concern in this area as well is the water use associated with geothermal energy production. Water is a precious and increasingly scarce resource in California and throughout the southwest. The impacts from water withdrawals in arid environments are well known and can include impacts to surface waters, springs, and seeps that are critical to many desert species from fish to bighorn sheep to rare plants. BLM should ensure that all federal reserved water rights essential to the protection of rare, imperiled and listed species, are fully protected on these and nearby public lands that may be affected by water use in the proposed geothermal leasing area. Specifically, the BLM must protect all water sources needed to ensure species and habitats survive and recover on our public lands.

Antropogenic global climate change has already altered the hydrology of montane regions. In the western United States, the following trends have been observed over the past century: an earlier streamflow by one to four weeks due to early snowmelt, a decrease in the percentage of precipitation that falls as snow, a decrease in mountain snow-water equivalent, increased frequency of heavy precipitation events as well as increased frequency of periods of drought, and a decrease in the duration and extent of snow cover. (IPCC, 2008). On average, early spring snowpack in the Sierra Nevada has decreased by 10% (1.5 million acre-feet). (DWR 2008). Studies project that extreme precipitation events during the winter will increase in the Sierra Nevada by 10-20% by 2040-2060. (Leung et al. 2004). Furthermore, by 2050, the Sierra Nevada snowpack is projected to decrease 25%-40% from its historic average. (DWR, 2008). Longer dry periods will be interspersed with heavy precipitation events, and droughts will increase in frequency.

Climate modeling also indicates that on average, California will experience higher temperatures in all seasons. (IPCC, 2008, Chung et al. 2009 (at page 8, Table 2). Warming temperatures will cause a shift to more winter precipitation from snow to rain, reducing snowpack and leading to shifts in the timing of runoff as well as decreased spring and summer runoff. (Chung et al. 2009 (page 4, 26); Kapnick and Hall, 2009). These changes will also have a profound impact on water availability in the project area.

As a result, in considering the proposed geothermal leasing area the BLM must fully identify and analyze both the potential water needs of the foreseeable geothermal development and the impacts such water use could have on the environment in the context of a changing climate. Alternatives that would require less water use should be considered in order to avoid significant impacts to the environment from the proposed development and comply with both NEPA and the ESA. Specifically, BLM should consider alternatives that would: encourage technological innovation to eliminate or vastly reduce the water needed for geothermal power production; require the use of recycled water where available; and require capture and treatment of all waste water so that it can be safely returned to groundwater basins through infiltration or reused on site.

The DEIS should consider at least one alternative that would *require* the use of the most water efficient technologies by all geothermal projects in the area as well as ensure that when and if new water saving technologies become available they must be adopted even for any existing projects.

Thank you for the opportunity to submit these comments, please do not hesitate to contact me if you have any questions. Please provide all future notices and documents related to this project to me at the address below.

Sincerely,

Lisa T. Belenky, Senior Attorney
Center for Biological Diversity
351 California St., Suite 600
San Francisco, CA 94104
(415) 436-9682 x307
Fax: (415) 436-9683

References:

Chung, et al., Department of Water Resources, May, 2009, Using Future Climate Projections to Support Water Resources Decision Making in California, A Report from: California Climate Change Center, available at http://www.water.ca.gov/climatechange/articles.cfm

Department of Water Resources, State of California. Managing an Uncertain Future: Climate Change Adaptation Strategies for California Water (2008).

Intergovernmental Panel on Climate Change (IPCC). Climate Change and Water. June, 2008.

Kapnick, Sarah and Alex Hall, March 2009, (Draft Paper) Observed Changes in the Sierra Nevada Snowpack: Potential Causes and Concerns, A Report From: California Climate Change Center, CEC-500-2009-016-D, available at http://www.climatechange.ca.gov/publications/cat/

Leung, L.R., Y. Qian, X. D. Bian, W.M. Washington, J.G. Han, and J.O. Roads. 2004. Mid-century ensemble regional climate change scenarios for the western United States. Climate Change 62:75-113.

Jeff Aardahl
<jaardahl@defenders.org>
11/05/2009 09:52 AM

To "John_Dalton@ca.blm.gov" <John_Dalton@ca.blm.gov>
cc
bcc
Subject Haiwee Issue Scoping Letter

John;
The subject letter is attached. Please include it in the official files for the proposed Haiwee Geothermal Leasing Project.

Thank you.

Jeff Aardahl
California Representative

1303 J Street, Suite 270 Sacramento, CA 95814
Tel: 916-313-5800 x110 | **Fax:** 916-313-5812
jaardahl@defenders.org | www.defenders.org

Haiwee_Geothermal_Scoping_Final_Letter.doc

California Office
1303 J Street, Suite 270 | Sacramento, CA 95814 | tel 916.313.5800 | fax 916.313.5812
www.defenders.org

November 5, 2009

Bureau of Land Management
California Desert District Office
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
(Sent via electronic mail to: John_Dalton@ca.blm.gov)

Attn: John Dalton, Haiwee Geothermal Leasing Coordinator

Dear Mr. Dalton:

This letter is in response to the Bureau of Land Management's (BLM) public invitation to submit issue scoping comments on the proposed Haiwee Geothermal Leasing Area located in Rose Valley near Coso Junction, California.

On behalf of Defenders of Wildlife (Defenders) and our more than 1,000,000 members and supporters in the U.S., 200,000 of which reside in California, I am writing to provide issue scoping comments to the Bureau of Land Management regarding the proposed Haiwee Geothermal Leasing Area located on approximately 22,000 acres of public land in Rose Valley near Coso Junction, California.

Defenders is dedicated to protecting all wild animals and plants in their natural communities. To this end, Defenders employs science, public education and participation, media, legislative advocacy, litigation, and proactive on-the-ground solutions in order to impede the accelerating rate of extinction of species, associated loss of biological diversity, and habitat alteration and destruction.

In the pursuit of the generation and transmission of electrical energy in California, we support renewable energy projects that are appropriately located, environmentally sustainable, and efficient. Defenders expects all government agencies involved in the review and permitting of proposed renewable energy project will adhere strictly to the highest administrative standards and reach decisions that are fully in the public interest and consistent with laws, regulations and policies regarding management of our environmental resources.

Defenders believes that renewable energy projects can be accommodated in the California Desert, but only if they are carefully designed and located in areas that avoid sacrificing what remains of our relatively intact desert landscape and its associated biological resources and values.

I attended the public scoping meeting held in Ridgecrest, CA on October 15, 2009 and found the meeting to be informative and well organized. At that meeting I raised several questions and issues associated with this proposed project. This letter contains the issues I raised plus additional information that I would like addressed in the planning and environmental compliance process for this proposed project.

National Headquarters
1130 17th Street, N.W.
Washington, D.C. 20036-4604
tel 202.682.9400 | fax 202.682.1331

California Office
1303 J Street, Suite 270 | Sacramento, CA 95814 | tel 916 313.5800 | fax 916 313.5812
www.defenders.org

Please address the following issues in the Environmental Impact Statement (EIS) for the Proposed Haiwee Geothermal Leasing Area:

1. Proposed Action: The EIS should contain a description of the reasonable foreseeable development of geothermal energy associated with the proposed action.

2. Alternatives: The EIS should analyze the effects of a reasonable range of alternatives, including the no action alternative. Other than the no action and proposed action, the alternatives should include alternatives that propose a smaller leasing area or areas as a means to avoid sensitive wildlife species and their habitats. Similar to issue #1, alternatives other than the no action should include a description of the reasonable foreseeable development of geothermal energy.

3. Mohave Ground Squirrel (MGS): The proposed leasing area is within the Mohave Ground Squirrel Habitat Management Area which was established in 2006 by BLM in the Record of Decision for the West Mojave Planning Area Amendments to the California Desert Conservation Area (CDCA) Plan.

The Record of Decision stated the purpose of establishing the MGS Habitat Management Area was to "…facilitate protective management for this species and serve to prevent further declines and assist the CDFG." The two primary goals with respect to the MGS are to:

1) Ensure long-term protection of MGS habitat throughout the region.

2. Ensure long-term viability of the MGS throughout its range.

The Record of Decision also changed the Multiple Use Class for public lands south of Owens Dry Lake in order to provide greater habitat protection for the MGS. Specifically, 136,086 acres was changed from Moderate Use Class to Limited Use Class, and 144 acres of Unclassified land was changed to Limited Use Class, for a total increase of 136,230 acres of Limited Use Class entirely within the MGS habitat management area.

Under the provisions of the West Mojave Planning Area amendments approved in 2006 were two requirements with respect to multiple use activities occurring on public within the MGS Habitat Management Area:

1) Habitat loss from any approved project is limited to one-percent of the total over the 30 year life of the plan.

2. Habitat loss will be compensated at a ratio of 5:1 through the acquisition of suitable MGS habitat on private land within the management area and managed for the conservation of the MGS.

The availability of suitable habitat in private ownership that could be used to meet this commitment needs to be addressed in the EIS.

National Headquarters
1130 17th Street, N.W.
Washington, D.C. 20036-4604
tel 202.682.9400 | fax 202.682.1331

California Office
1303 J Street, Suite 270 | Sacramento, CA 95814 | tel 916.313.5800 | fax 916.313.5812
www.defenders.org

In addition to the MGS conservation area identified above, the CDCA Plan of 1980 established the Rose Valley Habitat Management Area specifically for the MGS. According to the CDCA Plan, this 18,000 acre was to be managed to "Protect, Stabilize and/or Enhance Wildlife Values (CDCA Plan, Table 2, Planned Management Areas for Fish and Wildlife). According to our estimate, approximately 11,000 acres of this area is within the proposed Haiwee Geothermal Leasing Area. The compatibility of geothermal leasing and any associated surface use or development associated with geothermal energy extraction with the management goals for the Rose Valley MGS area needs to be carefully assessed.

We are particularly concerned over cumulative impact to the MGS and its habitat in the Rose Valley and the designated MGS management areas noted above. It appears the office and equipment yard facilities in Rose Valley near Coso Junction have been located on public lands, and recently the Hay Ranch Water Pipeline right of way issued to the Coso Operating Company has resulted in additional habitat losses totaling 32.24 acres. The cumulative impacts to the MGS and its habitat in the Rose Valley needs to be carefully addressed in the EIS in light of the strong conservation commitments BLM has made for this species.

Three non-competitive geothermal lease applications have been received by the BLM in the Rose Valley area. According to our estimate, all of the lands applied for by Metcalf (CACA 43993) and about 75 percent of the lands applied for by Maxx (CACA 44082) are within the Rose Valley Habitat Management Area. The issue of habitat loss in this area needs to be addressed in light of the long-term management goal of "Protect, Stabilize and/or Enhance Wildlife Values."

Wildlife habitat connectivity and species movements that may be affected by development within the proposed leasing area need to be studied and addressed. This is particularly important for the MGS (north-south connectivity) and the Desert Tortoise.

4. Water Resources: Extraction of groundwater in Rose Valley associated with geothermal energy resource development and the short and long term impacts of such extraction needs to be analyzed. The impacts to groundwater and surface water and associated wetlands at Little Lake need to be fully addressed. The recent disclosure that the steam reservoir in the existing Coso geothermal development within the China Lake Naval Air Weapons Station has been impacted by ground water loss due to geothermal power plant operations, and the recent permitting of groundwater pumping and transport from Rose Valley to the Coso Hot Springs area, suggests existing and any future geothermal developments will have a direct effect on water resources.

With regard to Little Lake, the EIS should analyze the potential adverse impacts to BLM administered lands at Little Lake and specifically to the Little Lake Watchable Wildlife Area established by BLM. Certain BLM lands include a portion of Little Lake and the basalt cliffs immediately east of the lake.

National Headquarters
1130 17th Street, N.W.
Washington, D.C. 20036-4604
tel 202.682.9400 | fax 202.682.1331

California Office
1303 J Street, Suite 270 | Sacramento, CA 95814 | tel 916.313.5800 | fax 916.313.5812
www.defenders.org

We strongly urge the BLM to work closely with the California Department of Fish and Game in all aspects of this proposed leasing project. We look forward to the opportunity to review and comment on the draft environmental impact statement for this effort.

Please contact me if you have any questions regarding our issue scoping comments.

Sincerely,

Jeff Aardahl

Jeff Aardahl
California Representative

National Headquarters
1130 17th Street, N.W.
Washington, D.C. 20036-4604
tel 202.682.9400 | fax 202.682.1331

DEPARTMENT OF TRANSPORTATION
District 9
500 South Main Street
Bishop, CA 93514
PHONE (760) 872-0785
FAX (760) 872-0754
TTY 711 (760) 872-0785

Flex your power!
Be energy efficient!

09 OCT -1 PM 3:34

September 29, 2009

John Dalton, Haiwee Geothermal Leasing Coordinator
California Desert District Office
Bureau of Land Management
22835 Calle San Juan De Los Lagos
Moreno Valley, California 92553

File: 09-FED
NOI EIS
SCH: none

Dear Mr. Dalton:

Haiwee Area Lease of Bureau of Land Management (BLM) Lands for Geothermal Use - Notice of Intent to Prepare an Environmental Impact Statement (NOI EIS)

The California Department of Transportation (Caltrans) District 9 appreciates the opportunity to review the proposed lease of BLM Lands near Haiwee Reservoir for Geothermal use.

Please consider the following while preparing the EIS:

- Address any potential highway transportation issues relevant to US 395. These may include highway access points for geothermal facilities, construction activities related to transport of materials and commuting of employees. Transportation system improvements including Caltrans permitting could be merited and thus be required of the lessee/project proponent.

Please continue to forward project information relevant to Caltrans. We value our cooperative working relationship in matters concerning project related transportation issues. If you have any questions, I may be contacted at (760) 872-0785.

Sincerely,

Gayle J. Rosander

GAYLE J. ROSANDER
IGR/CEQA Coordinator

c: Steve Wisniewski, Caltrans

Planning Department
168 North Edwards Street
Post Office Drawer L
Independence, California 93526

Phone: (760) 878-0263
FAX: (760) 878-0382
E-Mail: inyoplanning@inyocounty.us

November 4, 2009

Bureau of Land Management
Attn.: John Dalton, Haiwee Geothermal Leasing Area Coordinator
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

RE: Notice of Intent To Prepare an Environmental Impact Statement for the Proposed Leasing of Geothermal Resource Development in the Haiwee Geothermal Leasing Area Located In Inyo County, CA and To Amend the California Desert Conservation Plan

Mr. Dalton:

Please convey the County's thanks to your team for holding scoping meetings in Inyo County on October 13 in Lone Pine, October 14 in Bishop, and October 20 in Death Valley regarding the above-referenced Environmental Impact Statement (EIS). We understand that the project involves potential leases from the Bureau of Land Management (BLM) for approximately 22,500 acres of land in southwestern Inyo County for geothermal energy exploration, development, and utilization. Based on statements made at the meetings, we further understand that the development scenario to be considered in the EIS will be two 30 megawatt power plants.

As the project area is in the County in the vicinity of other geothermal resources, we will closely follow the Bureau's progress. The following comments summarize issues of particular relevance based on the limited information available at this time.

- Coordination with the County pursuant to the Federal Land Policy and Management Act (FLPMA) of 1976 should commence immediately. County staff is interested in discussing opportunities for joint Federal/State environmental reviews to expedite future geothermal projects, if appropriate, as well. Please contact me at your earliest convenience to begin the coordination process.
- This EIS is an excellent opportunity for the BLM to evaluate potential cumulative impacts at a programmatic level and streamline future permitting, particularly given the interest in solar and wind energy development in the vicinity. In addition to the environmental issues identified in the Notice of Intent, potential relevant environmental issues include aesthetics, utilities and public services, land use and planning, and

population and housing. It is suggested that the EIS identify a menu of mitigation measures that may be utilized if specified triggers are reached to address potential cumulative impacts, should they occur. Given the relatively small development scenario to be considered in the EIS, I am concerned that potential cumulative impacts will be underestimated, and that the EIS will not be adequate for individual future projects, thus leading to burdensome subsequent environmental analyses.

- The County is especially concerned about potential impacts on surface and subsurface waters (and related effects) that may result from the leases the BLM proposes, in addition to reasonably foreseeable past, present, and future projects. As the Bureau is aware, significant concerns have been expressed regarding groundwater pumping and interbasin water transfers in the vicinity, and in particular, for the recent pumping project for the Coso Geothermal Plant. The County has a substantial quantity of information from this effort that may be of assistance in the BLM's EIS.
- The EIS should evaluate potential impacts at the existing Coso Plant from the proposed leases. If the leases affect operations at the Coso Plant, significant socioeconomic and related effects could occur in the County.

Please convey to any potential applicants that the County's land use jurisdiction includes private projects on federal lands, and that County approval of a Conditional Use Permit will be required for exploratory and/or geothermal production projects. Geothermal energy development is regulated by Inyo County Code (ICC) Title 19, and interbasin water transfers are regulated by ICC Chapter 18.77. Please note also that the County will assess increased property valuation due to improvements that may result from the leases.

Thank you. We look forward to working with BLM as an integral partner to develop renewable energy resources for the benefit of local citizens, California, and the nation. I hope that BLM will coordinate with the County to streamline any future renewable energy development proposals to the greatest extent possible. You may call me at (760) 878-0263 or email me at mconklin@inyocounty.us if you have any questions. Please send the Planning Department any future notices regarding this project as well.

Sincerely,

Mike Conklin

Mike Conklin
Planning Director

cc: Board of Supervisors; Kevin Carunchio, CAO; County Counsel; file

RECEIVED
BUREAU OF LAND MGMT.

Planning Department
168 North Edwards Street
Post Office Drawer L
Independence, California 93526

Phone: (760) 878-0263
FAX: (760) 878-0382
E-Mail: inyoplanning@inyocounty.us

09 NOV -6 PM 12: 15

MORENO VALLEY, CA

November 4, 2009

Bureau of Land Management
Attn.: John Dalton, Haiwee Geothermal Leasing Area Coordinator
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

RE: Notice of Intent To Prepare an Environmental Impact Statement for the Proposed Leasing of Geothermal Resource Development in the Haiwee Geothermal Leasing Area Located In Inyo County, CA and To Amend the California Desert Conservation Plan

Mr. Dalton:

Please convey the County's thanks to your team for holding scoping meetings in Inyo County on October 13 in Lone Pine, October 14 in Bishop, and October 20 in Death Valley regarding the above-referenced Environmental Impact Statement (EIS). We understand that the project involves potential leases from the Bureau of Land Management (BLM) for approximately 22,500 acres of land in southwestern Inyo County for geothermal energy exploration, development, and utilization. Based on statements made at the meetings, we further understand that the development scenario to be considered in the EIS will be two 30 megawatt power plants.

As the project area is in the County in the vicinity of other geothermal resources, we will closely follow the Bureau's progress. The following comments summarize issues of particular relevance based on the limited information available at this time.

- Coordination with the County pursuant to the Federal Land Policy and Management Act (FLPMA) of 1976 should commence immediately. County staff is interested in discussing opportunities for joint Federal/State environmental reviews to expedite future geothermal projects, if appropriate, as well. Please contact me at your earliest convenience to begin the coordination process.
- This EIS is an excellent opportunity for the BLM to evaluate potential cumulative impacts at a programmatic level and streamline future permitting, particularly given the interest in solar and wind energy development in the vicinity. In addition to the environmental issues identified in the Notice of Intent, potential relevant environmental issues include aesthetics, utilities and public services, land use and planning, and

population and housing. It is suggested that the EIS identify a menu of mitigation measures that may be utilized if specified triggers are reached to address potential cumulative impacts, should they occur. Given the relatively small development scenario to be considered in the EIS, I am concerned that potential cumulative impacts will be underestimated, and that the EIS will not be adequate for individual future projects, thus leading to burdensome subsequent environmental analyses.

- The County is especially concerned about potential impacts on surface and subsurface waters (and related effects) that may result from the leases the BLM proposes, in addition to reasonably foreseeable past, present, and future projects. As the Bureau is aware, significant concerns have been expressed regarding groundwater pumping and interbasin water transfers in the vicinity, and in particular, for the recent pumping project for the Coso Geothermal Plant. The County has a substantial quantity of information from this effort that may be of assistance in the BLM's EIS.
- The EIS should evaluate potential impacts at the existing Coso Plant from the proposed leases. If the leases affect operations at the Coso Plant, significant socioeconomic and related effects could occur in the County.

Please convey to any potential applicants that the County's land use jurisdiction includes private projects on federal lands, and that County approval of a Conditional Use Permit will be required for exploratory and/or geothermal production projects. Geothermal energy development is regulated by Inyo County Code (ICC) Title 19, and interbasin water transfers are regulated by ICC Chapter 18.77. Please note also that the County will assess increased property valuation due to improvements that may result from the leases.

Thank you. We look forward to working with BLM as an integral partner to develop renewable energy resources for the benefit of local citizens, California, and the nation. I hope that BLM will coordinate with the County to streamline any future renewable energy development proposals to the greatest extent possible. You may call me at (760) 878-0263 or email me at mconklin@inyocounty.us if you have any questions. Please send the Planning Department any future notices regarding this project as well.

Sincerely,

Mike Conklin

Mike Conklin
Planning Director

cc: Board of Supervisors; Kevin Carunchio, CAO; County Counsel; file

Jeff Aardahl
<jaardahl@defenders.org>
09/11/2009 02:05 PM

To "John_Dalton@ca.blm.gov" <John_Dalton@ca.blm.gov>
cc
bcc
Subject Geothermal NOI

History: This message has been forwarded.

Hello John:

I plan to participate in the issue scoping for the proposal to issue leases in the Haiwee Geothermal Lease Area. I'd like to obtain some additional background information on the proposed action and perhaps you can help:

1. When and how did BLM establish the "Haiwee Geothermal Leasing Area" referred to in the Federal Register notice?

2. What is the administrative relationship between the Coso and Haiwee geothermal leasing areas?

3. Was the CDCA Plan amended by the record of decision for the Geothermal PEIS specifically for the Haiwee Geothermal Leasing Area?

4. Is the Haiwee Geothermal Leasing Area within the land area addressed by the Coso KGRA leasing decision?

I'd like to receive a copy of the Coso KGRA leasing decision if it is available. If you can think of any other items that would be helpful please let me know. Thanks for your assistance. I look forward to your reply.

Jeff Aardahl
California Representative

1303 J Street, Suite 270 Sacramento, CA 95814
Tel: 916-313-5800 x110 | **Fax:** 916-313-5812
jaardahl@defenders.org | www.defenders.org

"Kevin Doyle"
<Kevin_Doyle@comcast.net>

09/13/2009 03:58 PM

To <John_Dalton@ca.blm.gov>
cc
bcc
Subject Distribution list - Haiwee

History: This message has been forwarded.

Please add me to the distribution list

Thank You

Kevin Doyle
4 Espira Road
Santa Fe, NM 87508
Kevin_Doyle@comcast.net

Paul Friesema
<pfree@northwestern.edu>
09/11/2009 01:29 PM

To John_Dalton@ca.blm.gov
cc
bcc
Subject Geothermal Resource Development in Haiwee Geothermal Leasing Area

History: This message has been forwarded.

Please put me on the mailing list to receive scoping notices and summaries, etc. all the way through the NEPA process, for the Proposed Leasing of National System of Public Lands for Geothermal Resource Development in the Haiwee Geothermal Leasing Area.Please send material to:

Professor Paul Friesema
Environmental Policy and Culture Program
304 Scott Hall, Northwestern University
Evanston, IL. 60208-1006.

Thanks a lot! Paul

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

[LL91310000EI]

Notice of Intent To Prepare an

APPENDIX I: COMMENT TABLE

Commenter	Comments
Purpose and Need	
Big Pine Paiute Tribe of the Owens Valley	Examine tradeoffs of energy development, such as need for water, transmission lines, and potential loss of habitat. Asked the question, "Is providing energy for streetlighting a shopping center a good reason to threaten a spring?"
Scoping Meeting Oral Comment	Questioned the relationship of the many management plans in the project area and in close proximity, such as the California Desert Conservation Area (CDCA), Northern and Eastern Mojave (NEMO) Plan, and West Mojave (WEMO) Plan.
Scoping Meeting Oral Comment	Inquired about the study area, need for 20,000 acres, and amount of surface disturbance expected. Questioned if the anticipated power generation (60 MW for two power plants) would be sufficient to cover expense of construction and drilling.
Tom Budlong	Review pre-drilling exploration data to determine probability of exploratory completion and discovery of economic resource
Tom Budlong	Analyze the amount of geothermal releated activity the lease area could support
Tom Budlong	There is concern regarding the experimental nature of geothermal projects and compleximty of science and engineering the facilities. Requests that a panel of expert geothermal consultants examine the technical aspects of the project to arrive at a consensus, or document lack of consensus.
Project Description	
Arnold, Bleuel, Larochelle, Mathews & Zirbel, LLP	Identify geothermal plant's need for make-up water. Identify need for imported water.
Big Pine Paiute Tribe of the Owens Valley	Identify the Coso Known Geothermal Resource Area (KGRA) and Haiwee Geothermal Leasing Area. Disclose reason for not considering it in Coso KGRA.
Big Pine Paiute Tribe of the Owens Valley	Identify mitigation plans to compensate for loss of resource, goods, services, and values. Tribe recommends a fund for mitigation be established for each developed site. Consider the real cost of long-term mitigation, unquantifiable development impacts, and evaluation of royalties.
California Native Plant Society	Identify if geothermal projects will deplete geothermal resources through cooling systems and determine if surface water or groundwater will be required over the life of the proposed project. Request terms of leases or licenses incorporate statement of the water appropriation source or that no water appropriation will occur.
Center for Biological Diversity	Identify and analyze both the potential water needs for the foreseeable geothermal development and impacts such water use could have on the environment in context of a changing climate.
Defenders of Wildlife	Incorporate a reasonable foreseeable development of geothermal energy associated with the proposed action
Inyo County Planning Department (M. Conklin)	Identify a menu of mitigation measures that will be utilized if specific triggers are reached to address potential cumulative impacts. County's approval of a Conditional Use Permit is required for exploratory and/or geothermal production projects, regardless if jurisdiction includes private projects on Federal Lands.
Jeff Aardahl	Describe the establishment of the Haiwee Geothermal Leasing Area, administrative relationship between Coso and Haiwee geothermal leasing areas.
Jeff Aardahl	Discuss the Plan Amendment of California Desert Conservation Area (CDCA) Plan in regards to the Record of Decision for the Geothermal Programmatic EIS and the Haiwee Geothermal Leasing Area. Is the Haiwee Geothermal Leasing Area within the Coso known geothermal resource area (KGRA) leasing area?
Scoping Meeting Oral Comment	Inquired about the three pending lease applications, Reasonable Foreseeable Development (RFD) Scenario for proposed action, lifespan of geothermal power plant, and geothermal leasing application process. Questioned the level of assessment for the EIS and if additional environmental analyses would be conducted for specific geothermal projects within the Haiwee Geothermal Leasing Area.
Scoping Meeting Oral Comment	Inquired about Deep Rose Geothermal Exploration Project and the three pending lease applications.
Tom Budlong	Identify suitable and non-suitable locations for geothermal resource exploration, development and utilization. Analyzepotential geothermal facility configurations. Request the rejection of lease applications with configurations not analyzed in the EIS.
Tom Budlong	Describe the source and projected amount of water to support three phases (exploration, development, and utilization). Describe the cooling method and projected water usage rate for possible plant designs.
Tom Budlong	Describe the reclamation on completion of exploration, production, and utilization phases. Description to include conditon of propoerty, time allotted for each phase, time allowed for reclamation after completion of phases or expiration of lease, and bond amounts and conditions.
Alternatives	
Arnold, Bleuel, Larochelle, Mathews & Zirbel, LLP	Consider, study, and analyze alternative designs of available geothermal facilities (single-flash system, double-flash system, dry steam, binary and any number of hybrid designs, or more exotic designs). Consider conservation of the geothermal resource itself, minimization of environmental impacts and toxic emissions, and water conservation. Identify current geothermal technology to better enhance operations and more efficient use of water resources. Consider amount of electrical generation and lifespan of resource, as well as the annual natural recharge of geothermal fluids. Identify potential alternative sources of water (such as Ridgecrest Treatment Plant, Los Angeles Department of Water, Indian Wells Water Basin, construction of new water entrapment programs, and conservation and recycled water).
Center for Biological Diversity	Consider alternatives that require less water. Encourage technological innovation to eliminate or vastly reduce the water needed for geothermal power production; require use of recycled water where available; and require capture and treatment of all waste water to be safely returned to groundwater basins.
Defenders of Wildlife	Analyze the effects of a reasonable range of alternatives, including the no action alternative. Consider a smaller leasing area or areas to avoid sensitive wildlife species and their habitats.
Rose Valley Properties	Concerned about lack of a competitive bidding process for the leasing of government lands for other renewable energy development, such as solar, and multiple uses of the land.

Commenter	Comments
Air Quality	
Arnold, Bleuel, Larochelle, Mathews & Zirbel, LLP	Consider potential impacts caused by windborne dust and pollution, and impacts to air quality in Rose Valley. Address any contributions to non-attainment for PM_{10} particles.
Big Pine Paiute Tribe of the Owens Valley	Concerned about emissions of carbon dioxide into the atmosphere.
Tom Budlong	Analyze effects on greenhouse gases and global warming.
Biological Resources	
Arnold, Bleuel, Larochelle, Mathews & Zirbel, LLP	Request the study area include Little Lake Ranch property and Rose Valley in general for potential loss of water resources impacting habitat and vegetation. Will depletion of water within Rose Valley affect habitat and wetlands adjacent to U.S. Highway 395 and the Habitat Project at Little Lake? Will the underground water level adversely impact surface flora and fauna? Request baseline study of the surface habitat and all wildlife which rely upon surface water and functional ecosystem. Consider potential impacts to endangered species such as the Desert Tortoise and the Mohave Ground Squirrel. Analyze riparian habitats, sensitive natural communities, natural springs and artesian wells throughout the Rose Valley.
Center for Biological Diversity	Analyze direct, indirect and cumulative impacts across species' range. Of particular concern are impacts to the Mohave Ground Squirrel and the conservation area set aside for its recovery, wildlife habitats in the California desert
Defenders of Wildlife	The project area is in the Mohave Ground Squirrel Habitat Management Area and Rose Valley Habitat Management Area. Address the loss of habitat and discuss the availability of suitable habitat in private ownership to meet compensation. Address compatibility of geothermal leasing and any associated surface use or development associated with geothermal energy extraction with the Rose Valley Habitat Management Area. Discuss wildlife habitat connectivity and species movement, particularly the Mohave Ground Squirrel and Desert Tortoise.
Defenders of Wildlife	Concerned about cumulative effects to the Mohave Ground Squirrel, Rose Valley Habitat for the squirrel, and management areas.
Defenders of Wildlife	Recommend coordination with California Department of Fish and Game.
Rose Valley Properties	Consider alternative uses of the land such as solar energy.
Scoping Meeting Oral Comment	The project area is within the West Mojave Plan (WEMO). There is concern for the Mohave Ground Squirrel and its conservation area.
Tom Budlong	Request impacts to vegetation, animals and insects be addressed.
Cultural Resources	
Arnold, Bleuel, Larochelle, Mathews & Zirbel, LLP	Analyze potential impacts to Coso Hot Springs.
Big Pine Paiute Tribe of the Owens Valley	Native American Tribe requests initiation of the Seciton 106 Consultation before or at the start of scoping process and the presence of a Native American Monitor during archaeological surveys. New power plants require transmission lines thay may prohibit access and conflict with Native American values. Noted that impacts affecting Native American values are not amenable to mitigation, because these impacts typically involve desecration or sacrilegious treatment of spiritually important sites.
Scoping Meeting Oral Comment	The Native American Tribes are concerned about the Section 106 Consultation, extraction of resources from the land, and what types of benefits the Tribes would obtain from the proposed action. The Tribes are especially concerned about the connections to the Coso Hot Springs and the water table depth. Some local tribes requested additional information regarding geothermal leasing of lands to the Tribes. Inquired about leasing of lands to Tribes and potential benefits of proposed action to Tribes. Native American Tribes also requested additional involvement.
Tom Budlong	Concerned project area is an intersection of more than one tribes' territory and potential for cultural differences. Requests Native American Tribes be actively solicited for comments, including personal contact and formal notices. Requests that an archaeologist determine interested tribes, and collect and analyze comments.
Geothermal Resources / Geology / Soils	
Arnold, Bleuel, Larochelle, Mathews & Zirbel, LLP	Examine potential soil subsidence in Rose Valley as a result of groundwater withdrawal. Depletion of underground water basin and surface flows may have profound effect upon soil erosion, loss of topsoil, and capability of surface to sustain life. Address potential impacts on geologic resources and seismic issues related to high pressure injection of fluids directly into fault zones. If water cooling towers (WCTs) are utilized, address dramatic loss of heated liquids from evaporation.
Arnold, Bleuel, Larochelle, Mathews & Zirbel, LLP	Identify existence of geothermal resource, size and composition. Requests amount of electrical production from geothermal resource be based upon the size and extent of the reservoir. Address the preservation of the geothermal reservoirs and long-term management. Identify the different types of fluids that are contained in a GeoReservoir (both liquid and steam) and fluids re-injected.
Inyo County Planning Department (M. Conklin)	Consider potential impacts to the existing Coso Plant and operations.
Scoping Meeting Oral Comment	The public was concerned about the seismic activity in the area and questioned if geothermal exploration and development contributed to increased seismic activity. They questioned if injection of water into the rocks would contribute to fracturing. USFS Coordination was also requested.
Scoping Meeting Oral Comment	Questioned if the project area was within a Known Geothermal Resource Area (KGRA), such as Coso, and if viable geothermal resources were present in the project area. Concerned about impacts to the Coso Geothermal Power Plant and operations, as well as the Coso Hot Springs. Inquired about Deep Rose Geothermal Exploration Project and the three pending lease applications. Inquired about the cumulative impacts of numerous geothermal projects (existing and future) in close proximity.

Commenter	Comments
Hazards & Hazardous Materials	
Arnold, Bleuel, Larochelle, Mathews & Zirbel, LLP	Analyze the potential for wastewater and emission hazards to the public.
Arnold, Bleuel, Larochelle, Mathews & Zirbel, LLP	Analyze potential for hazardous substances generation by proposed project, and treatment and disposal of substances. Address potential impacts from heat emissions.
Land Use / Agriculture / Recreation	
Arnold, Bleuel, Larochelle, Mathews & Zirbel, LLP	Analyze potential impacts to Rose Valley water well owners and nearby agricultural operations in Rose Valley.
Scoping Meeting Oral Comment	Concerned about impacts to motorized recreational roads and requested mitigation for loss of roads from Northern and Eastern Mojave Planning (NEMO) decision.
Scoping Meeting Oral Comment	Questioned the relationship of the many management plans in the project area and in close proximity, such as the California Desert Conservation Area (CDCA), Northern and Eastern Mojave (NEMO) Plan, and West Mojave (WEMO) Plan.
Tom Budlong	Concerned about land use conflicts, including recreation.
Noise & EMF	
Arnold, Bleuel, Larochelle, Mathews & Zirbel, LLP	Evaluate noise generation from proposed project. Evaluate noise levels and impacts to workers and surrounding wildlife.
Socioeconomics	
Inyo County Planning Department (M. Conklin)	Consider potential impacts to population and housing, and potential for socioeconomic impacts or adverse impacts to Coso Plant.
Rose Valley Properties	Consider potential impacts and mitigation steps for private and public landholders who have mineral and water rights in areas directly surrounded by proposed lands.
Scoping Meeting Oral Comment	Inquired about the creation of jobs and potential for revenue generation for Inyo County. Concerned about restrictions from the California Desert Conservation Area (CDCA) Plan causing delays. Noted the lengthy geothermal leasing application process and need for further project specific environmental analysis. Requested a socioeconomic analysis.
Tom Budlong	Describe and analyze the economic risk of drilling at deep depths (18,000-20,000 feet)
Tom Budlong	Request that applicants, such as Deep Rose, analyze and describe their financial strength to finance the expense of drilling at deep depths.
Traffic & Transportation	
Dept. of Transportation	Address potential highway transportation issues relevant to US 395, such as highway access points for facilities, and transport of construction materials and workforce.
Utilities & Public Services / Public Health & Safety	
Scoping Meeting Oral Comment	The public questioned if adequate electrical transmission was available to transfer the geothermal energy to the load centers. Are there plans to upgrade the existing transmission lines or construct a substation in the area?
Arnold, Bleuel, Larochelle, Mathews & Zirbel, LLP	Analyze the potential for wastewater and emission hazards to the public.
Tom Budlong	Concerned about human health and safety.
Visual Resources	
Arnold, Bleuel, Larochelle, Mathews & Zirbel, LLP	Consider the recreational uses of the Rose Valley and impacts of the construction of structures and geothermal facilities

Commenter	Comments
Water Resources	
Arnold, Bleuel, Larochelle, Mathews & Zirbel, LLP	Consider water contained in the Rose Valley underground water basin. Analyze potential reduction of water available to Little Lake, the downstream ponds, creeks, wetlands, water wells, and natural springs. Little Lake Ranch provides wildlife habitat and wildlife-oriented recreation, including hunting, fishing, and wildlife viewing. Little Lake also includes a navigable body of water, ponds and wetlands. Any reliance upon underground water resources of the Rose Valley is subject to the County's groundwater ordinance and may have severe and direct impacts upon Little Lake Ranch property. Address the availability of local water sources for injection, and adequacy to supply, and natural replenishment of imported water source. Request long-term pumping studies prior to issuance of any permits. Determine if a connection between the GeoReservoir and Water Basin is present and evaluate potential impacts to use and consumption of GeoReservoirs on local Water Basins.
Big Pine Paiute Tribe of the Owens Valley	Water in the desert area is precious and extraction of water from arid region could alter a spring or kill or diminish the life forms that depend on water, which may lead to permanent loss of habitat.
Big Pine Paiute Tribe of the Owens Valley	The Native American Tribes are concerned about large amounts of water pumped from the Rose Valley by the Coso Operating Company and LADWP. These exports may seriously impact water availability for geothermal development in the vicinty
Big Pine Paiute Tribe of the Owens Valley	Concerned about the water supply and the availability of water for other development projects, such as the Haiwee Geothermal Leasing Area.
California Native Plant Society	Concerned about the use of water in "renewable" energy projects and indirect effects to wetland habitats. Request analysis of potential impacts from appropriated water and wetland habitats maintained by appropriated water.
Center for Biological Diversity	Concerned about increasing scarcity of water in California and thought southwest. Address need for water use associated with geothermal energy production. Ensure all federal reserved water rights are protected in the project area and nearby public lands affected by water use. Consider impacts of water withdrawals in arid environmental, and impacts to surface waters, springs, and seeps that are critical to many desert species from fish to bighorn sheep to rare plants.
Defenders of Wildlife	Address extraction of groundwater in Rose Valley for geothermal energy development and short and long term impacts of extractions. Address impacts to groundwater and surface water and associated wetlands at Little Lake. Analyze the potential adverse impacts to BLM-administered lands at Little Lake and specifically to the Little Lake Watchable Wildlife Areas established by BLM
Inyo County Planning Department (M. Conklin)	Concerned about potential impacts on surface and subsurface waters, specifically groundwater pumping and interbasin water transfers in the vicinity.
Rose Valley Properties	Requests that no new geothermal development occur until recharge of Rose Valley basis is better known. Consider other projects that impact the basin. Consider water quality impacts from the drilling of wells.
Scoping Meeting Oral Comment	Concerned about the potential for impacts to water resources. Inquired about the need for groundwater provisions, source of water, and water issues with geothermal projects. Concerned about potential impacts to subsurface water, aquifers, wetlands, and water table depth, especially to the Rose Valley, Little Lake, and the wetlands surrounding the lake. There was also concern for the water table depth, aquifers, and protection of watersheds. The Tribes were concerned about impacts to the Coso Hot Springs in close proximity to the project area.

Commenter	Comments
Cumulative Effects	
Arnold, Bleuel, Larochelle, Mathews & Zirbel, LLP	Consider long-term baseline studies prior to issuance of permit. Analyze actual availability of underground water storage, historical water levels, recharge and consumption within Rose Valley Basin, existence of all wildlife resources, existence and health of surface vegetation, plant life and habitat, surface flows at Little Lake and its surrounding ponds and creeks, catalog of all springs and artesian wells within Rose Valley, identification of all water users and their consumption of water within the Rose Valley, current air quality conditions, cultural resources, and soils and geology conditions.
Big Pine Paiute Tribe of the Owens Valley	The Native American Tribes are concerned about large amounts of water pumped from the Rose Valley by the Coso Operating Company and LADWP. These exports may seriously impact water availiability for geothermal development in the vicinty
Big Pine Paiute Tribe of the Owens Valley	There is concern regarding the cumulative impacts of large-scale operations in the vicinity of the proposed project, such as LADWP operations, Owens Lake Dust mitigation, water exports by Coso Hay Ranch, and livestock grazing. Cumulative effects should included an analysis of inventory and characterization of wetlands (all springs and seeps) and regional hydrology, vegetation, wildlife, rare plant and animal species, geology, aesthetic/scenic values, recreation, and dust generation.
Defenders of Wildlife	Concerned about cumulative effects to the Mohave Ground Squirrel, Rose Valley Habitat for the squirrel, and management areas.
Internal Scoping Comment	Concern for cumulative impacts from a number of applications for ROW grants in the project area. A number of projects and developments in the area that are outside of BLM jurisdiction, such as wind projects, substation at the Coso Hay Ranch Property, transmission line upgrades, and hydroplant at Haiwee.
Inyo County Planning Department (M. Conklin)	In addition to geothermal energy development, evaluate potential cumulative impacts of future permitting for solar and wind energy development. Identify a menu of mitigation measures that will be utilized if specific triggers are reached to address potential cumulative impacts. Concerned that development scenario is relatively small and may underestimate potential cumulative impacts and future projects and development.
Scoping Meeting Oral Comment	Another key concern for the proposed action is cumulative impacts. There are a number of geothermal projects in close proximity to the project area (such as Deep Rose and Coso Geothermal Fields) and public, agencies, organizations, and tribes are concerned about the cumulative effects. BLM also has a number of management plans in the desert (i.e., CDCA, NEMO, and WEMO) and the public questions how these plans would affect the proposed action.
Tom Budlong	Concerned about cumulative effects of groundwater extraction by existing Coso Geothermal operations, Deep Rose, and additional lessees.
Tom Budlong	Concerned about cumulative impacts from existing, proposed and potential geothermal projects in the area, as well as other non-geothermal projects, but not limited to the project area boundaries.
Other Comments	
Arnold, Bleuel, Larochelle, Mathews & Zirbel, LLP	Requests consideration of studies, reports, evidence and comments prepared for BLM's Coso Project Environmental Assessment (EA) and Inyo County's Coso Environmental Impact Report (EIR).
Arnold, Bleuel, Larochelle, Mathews & Zirbel, LLP	Request written notice of any hearings, actions, decisions, meetings, studies, applications or procedures concerning Haiwee, and production of public records in connection with Project.
Big Pine Paiute Tribe of the Owens Valley	Consider the tradeoffs of geothermal development.
Inyo County Planning Department (M. Conklin)	Request coordination and involvement in a joint Federal/State environmental review. Consider potential impacts to aesthetics, utilities and public services, land use planning, and population and housing.
Scoping Meeting Oral Comment	The Native American Tribes and Inyo County planners requested additional coordination and notification regarding the project.
Scoping Meeting Oral Comment	Informed project team about Federal Register notice containing non-functional website links and different end dates for comment period. Requested additional notification to the public, local agencies, and Native American Tribes.
Tom Budlong	Concerned about need to drill at deep depths (18,000- 20,000 feet) and the financial risk it would incur. There is also concern for the applicants' experience and knowledge of geothermal resource exploration and development.
Tom Budlong	Analyze the ability and capacity for BLM to manage and monitor the activity without impacting its other responsibilities

APPENDIX I

Haiwee Geothermal Leasing Area

Lands Under Bureau of Land Management

Stewardship

Haiwee Geothermal Leasing Area Lands Under Bureau of Land Management Stewardship:

Fee Ownership

Mount Diablo Meridian,
T. 21 S., R. 37 E.,
sec. 11, lot 1, 2, 9 to 11, inclusive, 14, W1/2NW1/4NW1/4NE1/4, NW1/4SW1/4NW1/4NE1/4, NE1/4NW1/4, W1/2SE1/4SW1/4;
Unsurveyed Protracted Block 41, All;
Unsurveyed Protracted Block 42, All;
sec. 14, lots 1 to 3, inclusive, 5 to 10, inclusive, NE1/4NE1/4, W1/2NE1/4NW1/4, NW1/4SW1/4, S1/2SW1/4, SE1/4SE1/4;
sec. 23, N1/2S1/2, N1/2S1/2S1/2, S1/2SE1/4SE1/4;
sec. 25;
sec. 26, E1/2E1/2;
sec. 35,
sec. 36.

Mount Diablo Meridian,
T. 22 S., R. 37 E.,
sec. 1;
sec. 2, lots 3 to 14, inclusive;
sec. 11;
sec. 12.

Mount Diablo Meridian,
T. 21 S., R. 38 E.,
sec. 7;
sec. 8;
sec. 9;
sec. 10;
sec. 15;
sec. 17;
sec. 18;
sec. 19;
sec. 20;
sec. 21;
sec. 22;
sec. 27;
sec. 28;
sec. 29;
sec. 30;
sec. 31;
sec. 32;
sec. 33;
sec. 34.

Mount Diablo Meridian,
T. 22 S., R. 38 E.,
sec. 5;
sec. 6, lots 3 to 14, inclusive;
sec. 7;
sec. 8.

Containing **21,233.07** acres more or less.

Mineral Only

Mount Diablo Meridian,
T. 21 S., R. 37 E.,
sec. 11, lots 4 to 7, inclusive, 12, 13, NE1/4NE1/4, E1/2NW1/4NE1/4, E1/2W1/2NW1/4NE1/4, SW1/4SW1/4NW1/4NE1/4, E1/2SE1/4SW1/4, S1/2SE1/4;
sec. 14, lot 11, E1/2NE1/4NW1/4;
sec. 23, S1/2S1/2SW1/4, S1/2SW1/4SE1/4
sec. 26, SW1/4, W1/2E1/2.

Containing **1,572.27** acres more or less.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
RIDGECREST FIELD OFFICE
300 S. Richmond Road
Ridgecrest, CA 93555

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300