MINUTE ITEM

80

08/21/96
W 40722
A. WILLARD
J. ADAMS
E. KRUGER

CALIFORNIA ENERGY GENERAL CORPORATION
(PROPOSED LESSEE)

ITEM PULLED PRIOR TO COMMISSION MEETING

Item attached

CALENDAR ITEM

80

08/21/96
W 40722
A. WILLARD
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E. KRUGER

CALIFORNIA ENERGY GENERAL CORPORATION
(PROPOSED LESSEE)

ITEM PULLED PRIOR TO COMMISSION MEETING

CALENDAR ITEM

C80

A 2

S 4

08/21/96
W 40722
A. Willard
J. Adams
E. Kruger

APPROVE A NEGOTIATED SUBSURFACE (NO SURFACE USE) GEOTHERMAL RESOURCES LEASE ON ABOUT 449 ACRES OF STATE LAND IN THE GLASS MOUNTAIN AREA, SISKIYOU COUNTY

PROPOSED LESSEE:

California Energy General Corporation
Attn: Vincent Signorotti, Manager of Lands
551 W. Main Street, Suite 1
Brawley, California 92227

AREA, TYPE LAND AND LOCATION:

Approximately 449 acres of State sovereign land located beneath Medicine Lake in portions of Sections 10 and 11, T43N, R3E, MDM in eastern Siskiyou County about 50 miles east of Yreka, California (see Exhibit "A" for land description and location map).

PROPOSED LEASE TERMS:

1. The form of lease provides for "Subsurface Only - No Surface Use".

2. The primary term is ten years and for so long as geothermal resources are being produced or utilized, or are capable of being produced or utilized, in commercial quantities from the leased land or from lands unitized with the leased land, unless sooner terminated as provided in this lease.

3. Royalty of 12 1/2 percent of the value of geothermal resources produced from the leased land. The basis for the value of geothermal resources shall be agreed upon by the State and Lessee prior to commercial utilization. In the event the leased land is unitized with other lands, the royalty shall apply to the leased land's unit participation.

4. Rent of $1.00 per acre per year, payable in advance.

5. Initial drilling requirement is three years. The drilling requirement may be extended by the State for a period of up to two years based on information provided by Lessee justifying the need for an extension.

BACKGROUND:

California Energy General Corporation (C.E.G.C.) has submitted an application for a negotiated subsurface (no surface use) geothermal resources lease comprising approximately 449 acres of State sovereign land beneath Medicine Lake. All exploration and development activities (subsurface) will be conducted by C.E.G.C. from adjacent federal leased land, as no activities are authorized on the surface of the State's land.

PREREQUISITE CONDITIONS, FEES AND EXPENSES:

Filing fee, processing cost and the first year's rent have been received from the Applicant.

STATUTORY AND OTHER REFERENCES:

A. Public Resources Code: Div. 6, Parts 1 and 2; Div. 13.
B. Cal. Code Regs.: Title 3, Div. 3; Title 14, Div. 6.

AB 884:

N/A

OTHER PERTINENT INFORMATION:

1. CEQA Guidelines Section 15378(a)(3) identifies the issuance of a lease as a "project". However, there will be no surface use of the State leased land for any purpose. As such, the location of the development project will be on C.E.G.C.'s adjacent federal leased land within Siskiyou County. The project required approvals from both federal and local agencies. An environmental document was prepared for review as both an Environmental Assessment (EA) under the National Environmental Policy Act (NEPA) and as an Initial Study (IS) under the CEQA.

The U. S. Department of the Interior's Bureau of Land Management (BLM) functioned as lead agency for the project subject to NEPA and the Siskiyou County Air Pollution Control District (SCAPCD) functioned as lead agency for the project pursuant to the State CEQA Guidelines (Sections 15000, et. seq.).

The Glass Mountain Unit Geothermal Exploration Project EA/IS (EA #CA027-EA95-06, SCH No. 95041056) was approved by the BLM's Susanville District, Alturas Resource Area, as NEPA lead agency, on August 25, 1995, and the SCAPCD, as CEQA lead agency, approved the project on July 31, 1995. A copy of this document is on file at the offices of the State Lands Commission.

2. The Lessee will be limited to those activities which are analyzed in the environmental document. Should commercial operations become feasible and Lessee chooses to pursue those commercial operations, further environmental documentation from the BLM and the SCAPCD would be required.

3. This activity does not involve lands identified as possessing significant environmental values pursuant to Public Resources Code Sections 6370, et. seq.

4. On May 1, 1993, C.E.G.C. entered into a Geothermal Unit Agreement unitizing their federal leases in the Glass Mountain area. These leases comprise about 37,845 acres. C.E.G.C. has a 70 percent interest in the Unit. Most of the remainder of the Unit is controlled by Freeport-McMoRan. C.E.G.C. proposes that this lease containing approximately 449 acres of State sovereign land is added to the Glass Mountain Unit. If the lease is approved, Paragraph 13 of the lease will give the Commission's consent to become a party to the Unit Agreement.

EXHIBITS:

A. Land Description

B Glass Mountain Unit Geothermal Exploration Project EA/IS, EA#CA027-EA95-06, SCH. No. 95041056

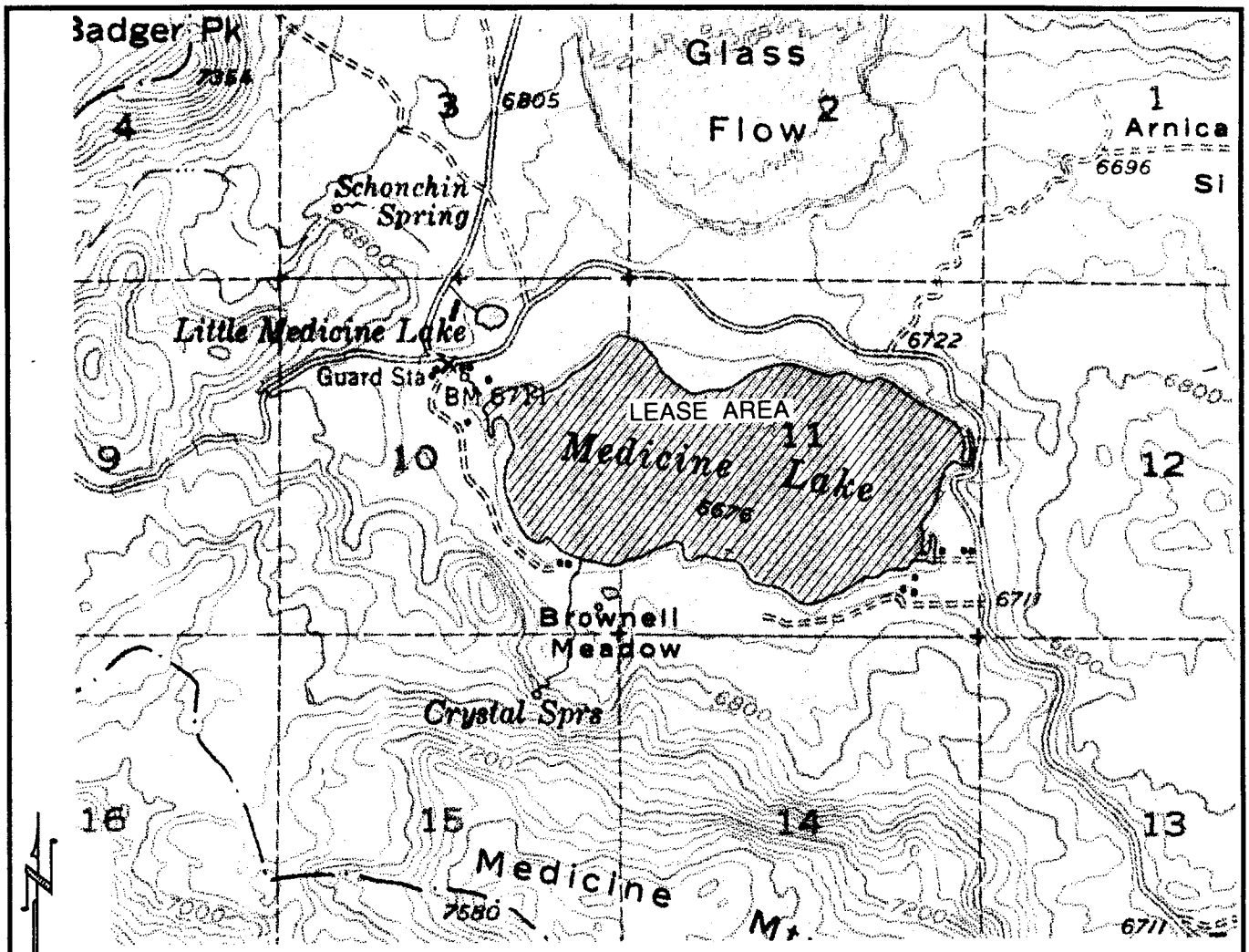
IT IS RECOMMENDED THAT THE COMMISSION:

1. FIND THAT THE ENVIRONMENTAL DOCUMENT FOR THE GLASS MOUNTAIN UNIT GEOTHERMAL EXPLORATION PROJECT (EA/IS, EA#CA027-EA95-06, SCH. #95041056) WAS PREPARED FOR REVIEW AS BOTH AN ENVIRONMENTAL ASSESSMENT AND AS AN INITIAL STUDY, AND SUBSEQUENTLY APPROVED AS A FINDING OF NO SIGNIFICANT IMPACT BY THE BUREAU OF LAND MANAGEMENT UNDER NEPA AND ADOPTED AS A MITIGATED NEGATIVE DECLARATION BY THE COUNTY OF SISKIYOU'S AIR POLLUTION CONTROL DISTRICT PURSUANT TO THE REQUIREMENTS OF THE CEQA, AND THAT THE STATE LANDS COMMISSION HAS REVIEWED AND CONSIDERED THE INFORMATION THEREIN.

2. FIND THAT THIS ACTIVITY WILL NOT INVOLVE LANDS IDENTIFIED AS POSSESSING SIGNIFICANT ENVIRONMENTAL VALUES PURSUANT TO PUBLIC RESOURCES CODE SECTIONS 6370, ET. SEQ.

3. AUTHORIZE THE ISSUANCE OF A NEGOTIATED SUBSURFACE (NO SURFACE USE) GEOTHERMAL RESOURCES LEASE TO CALIFORNIA ENERGY GENERAL CORPORATION FOR A PRIMARY TERM OF TEN YEARS, EFFECTIVE JULY 1, 1996, IN ACCORDANCE WITH PUBLIC RESOURCES CODE SECTIONS 6901 AND 6905.

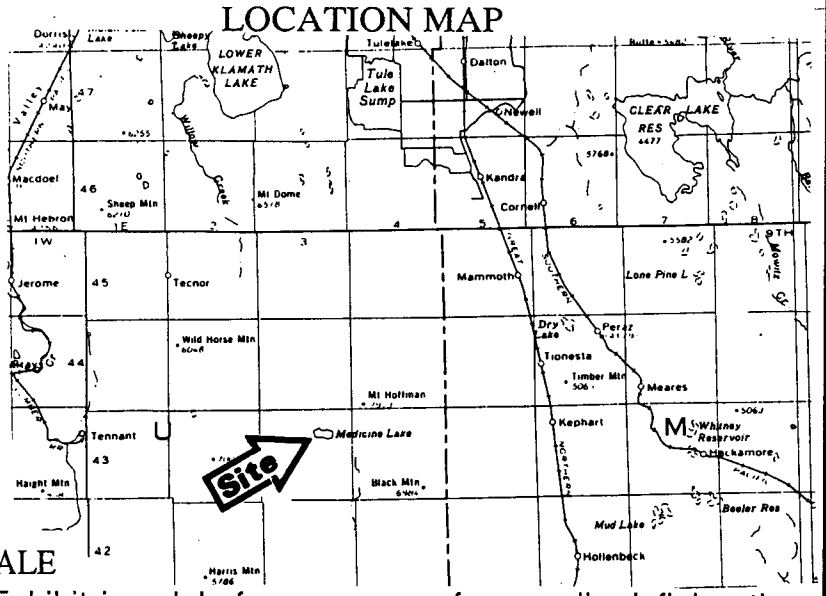
4. AUTHORIZE CALIFORNIA ENERGY GENERAL CORPORATION TO SUBMIT THE JOINDER AGREEMENT TO COMMIT THIS LEASE TO THE GLASS MOUNTAIN UNIT NO LATER THAN SEPTEMBER 30, 1996.



Sections 10 & 11, T43N, R3E, MDM

NO SCALE

LOCATION MAP



NO SCALE

This Exhibit is solely for purposes of generally defining the lease premises, and is not intended to be, nor shall it be construed as, a waiver or limitation of any State interest in the subject or any other property.

EXHIBIT "A"

W 40722

Geothermal Lease

Medicine Lake

SISKIYOU COUNTY

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PROJECT:	GLASS MTN.
SUBS:	3.1.1
DATE:	
W.G. DIST:	Y (N)
COPIES:	

Glass Mountain Unit Geothermal Exploration Project

Environmental Assessment/Initial Study

EA #CA027-EA95-06

SCH #95041056

Leases CA-12367, CA-12370, CA-12371
CA-12372, CA-1224, CA-2500

August 1995

NEPA Lead Agency

U.S. Department of the Interior, Bureau of Land Management
Susanville District, Alturas Resource Area
708 West 12th Street
Alturas, California 96101

Surface Managing Agency

U.S. Department of Agriculture, Forest Service
Modoc National Forest
800 West 12th Street
Alturas, California 96101

CEQA Lead Agency

Siskiyou County Air Pollution Control District
525 South Foothill Drive
Yreka, California 96097

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EXHIBIT "B"

Finding of No Significant Impact (FONSI)
Glass Mountain Unit Geothermal Exploration Project
Environmental Assessment/Initial Study

EA NO. CA027-EA95-06

The Department of the Interior, Bureau of Land Management (BLM), as lead federal agency, has reviewed the attached EA for Glass Mountain Unit Geothermal Exploration Project, which was prepared in accordance with the National Environmental Policy Act (NEPA). The EA has assessed the environmental effects of the proposed action (Alternative A) and other alternatives, including the "No Action" alternative. The EA documents that implementation of the proposed action with the identified mitigation measures will not result in significant environmental effects to the biological, physical or social/cultural environment. I conclude that this proposed action is not a major federal action and that preparation of an Environmental Impact Statement pursuant to Section 102(2)(c) of the NEPA is not required.

Consistency Statement:

Implementation of the proposed Action is consistent and tiers to the Modoc National Forest Land and Resource Management Plan (November 1991) and Supplemented Environmental Assessment for Geothermal leasing of National Forest System lands in the Glass Mountain Known Geothermal Resource Area, September, 14, 1994.

Reviewed by:	Environmental Coordinator/BLM	8/25/95 Date
Reviewed by:	Environmental Coordinator/USFS	8/25/95 Date
Approved by:	Area Manager BLM	8/25/95 Date

Attachments:

EA CA027-EA95-06
Appendix D, EA CA027-EA95-06

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DECISION RECORD
Glass Mountain Unit Geothermal Exploration Project
Environmental Assessment/Initial Study

EA NO. CA027-EA95-06

DECISION: It is my decision to approve the proposed action of the Glass Mountain Unit Geothermal Exploration Project as evaluated in the attached Environmental Assessment (EA)NO. CA027-EA95-06. Mitigation measures identified for the proposed action in the EA have been formulated into conditions of approval as listed in Appendix C.

SUMMARY of PROPOSED ACTION: California Energy General Corporation (CEGC), as Unit Operator of the Glass Mountain Federal Geothermal Unit (14-080001-18160), has submitted a Plan of Operation (POO) for exploratory geothermal drilling within the Glass Mountain Known Geothermal Resource Area (KGRA) on the Federal Geothermal Leases CA-12367, CA-12370, CA-12371, CA-12372, CA-1224 and CA-2500). The action will occur on Federal lands which are under are management by the Modoc and Shasta-Trinity National Forests.

CEGC proposes to drill up to 5 exploratory geothermal temperature core holes (TCH) wells and to drill, complete, and test deep (production size) exploration wells at five well pads within the KGRA. At least 2 wells will be drilled at each of the five exploration well pads. For a more detailed description of the action see the attached EA.

RATIONAL: The decision will not cause any undue or unnecessary environmental degradation and is consistent with the Modoc National Forest Land and Resource Management Plan (November 1991) and tiers to the Supplemented Environmental Assessment for Geothermal leasing of National Forest System lands in the Glass Mountain Known Geothermal Resource Area, September, 14, 1994.

The proposed action, when implemented with the appropriate mitigation measure will have "No Effect" on any listed or candidate threaten and endangered species.

The Modoc National Forest has assisted in the preparation of the EA and has recommended approval of the proposed action with the incorporation of the mitigation and compliance items, found in Appendix C.

MITIGATION AND MONITORING:

1. The mitigation and monitoring plan (Appendix C) has been developed for this project and is incorporated into this decision.

2. Road access and well pad construction at well 46-32 shall not commence until drilling at site 28-32 has verified that a potentially commercial geothermal source exist at the well site.

3. Drilling at 15-15TGH shall not begin prior to August 15th.

4. Vehicular traffic associated with the expoloration activities shall not use the roads within the Lava Beds National Monument (LBNM).

PUBLIC REVIEW AND COMMENT:

The EA and Draft Finding of No Significant Impact (FONSI) for the proposed action were distributed for public review from April 24, 1995 to May 24, 1995, and comments were received during the public review period. These comments were considered before approving the proposed action (Alternative A). Comment letters and responses to these comments are included as Appendix D of the EA.

Approved by: Del Burns
Alturas RA Area Manager

8/25/95
Date

Attachments:
EA CA027-EA95-06
FONSI for CA027-EA95-06

AIR POLLUTION CONTROL OFFICER:
James R. Massey, Jr.

525 SO. FOOTHILL DR.
YREKA, CALIFORNIA 96097
PHONE: (916) 842-8029

FAX: (916) 842-6690

County of Siskiyou

COUNTY AIR POLLUTION CONTROL BOARD:
(BOARD OF SUPERVISORS, EX-OFFICIO)

AIR POLLUTION SPECIALIST
PATRICK J. GRIFFIN

AIR POLLUTION CONTROL DISTRICT

NEGATIVE DECLARATION
Glass Mountain Unit Geothermal Exploration Project
State Clearinghouse No. 95041056

This Negative Declaration for the proposed Glass Mountain Unit Geothermal Exploration Project has been prepared pursuant to the California Environmental Quality Act (Division 13 of the California Public Resources Code) and the State CEQA Guidelines (Section 15000 *et seq.*).

PROJECT DESCRIPTION: California Energy General Corporation (CEGC), as Unit Operator of the Glass Mountain Federal Geothermal Unit (14-08-0001-18160), has proposed to implement a Plan of Operation (POO) for exploratory geothermal drilling within the Glass Mountain Known Geothermal Resource Area (KGRA) in the Medicine Lake Highlands, on the Modoc and Shasta-Trinity National Forests in Siskiyou County, California. The proposed project would occur on U.S. Bureau of Land Management (BLM) geothermal lease lands (Federal Geothermal Leases CA-12367, CA-12370, CA-12371, CA-12372, CA-1224, and CA-2500).

DETERMINATION: The attached Initial Study (IS) has been prepared for the proposed project. On the basis of the IS, the Siskiyou County Air Pollution Control District (APCD), as lead agency, has determined that implementation of the proposed project (Alternative A) with identified mitigation measures would not have a significant adverse impact on the environment for the following reasons:

- There would be no significant effect on geology, soils, or unique geologic features from implementation of the project. Potential erosion effects would be mitigated by engineering practices, and well pads would be located at a sufficient distance from unique geologic features in the area to avoid potential effects.
- The project would not affect surface or groundwater resources in the area. Mitigation would ensure that Paynes Springs would not be adversely affected.
- The project would not affect identified cultural resources and would not interfere with traditional Native American uses in the region. Mitigation is defined in the event that previously unidentified resources are discovered during construction activities.
- The project would not significantly affect vegetation or wildlife. Mitigation would be implemented where feasible to avoid conifer species that could be used by wildlife. Removal of potential habitat for the northern spotted owl, northern goshawk, and American marten would not result in significant impacts to these species, and mitigation is proposed to ensure no effect to these species. Mitigation is also proposed to minimize disturbance of general wildlife habitat in the vicinity.
- The project would not result in releases of any gases (including hydrogen sulfide (H_2S)) that would exceed standards, result in nuisances, or pose a human health hazard. Project emissions would not result in the exceedance of state or federal ambient air quality standards. Fugitive dust emissions would be controlled by watering during construction.

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- Noise from the project would not significantly affect sensitive noise receptors (e.g., campgrounds and private residences near Medicine Lake). Noise mufflers would be used on project equipment.
- The project would not significantly affect long-range or short-range views, and would be consistent with existing land uses, leases, policies, and plans. Mitigation is proposed to avoid conflicts with recreational users and traffic using roads in the Medicine Lake area. The project would not have a significant effect on population, employment, housing, or property values.

The IS and Draft Negative Declaration for the proposed project were distributed for public review from April 24, 1995 to May 24, 1995, and comments were received during the public review period. These comments (along with the proposed Negative Declaration) were considered by the Siskiyou County APCD before approving the proposed project. Comment letters received during the public review period and responses to these comments are included as Appendix D of the IS.

Patrick J. Griffin

Patrick J. Griffin
Air Pollution Control Specialist
Siskiyou County Air Pollution Control District

7-31-95
Date

Glass Mountain Unit Geothermal Exploration Project

Environmental Assessment/Initial Study

EA #CA027-EA95-06

SCH #95041056

Leases CA-12367, CA-12370, CA-12371
CA-12372, CA-1224, CA-2500

August 1995

NEPA Lead Agency

U.S. Department of the Interior, Bureau of Land Management
Susanville District, Alturas Resource Area
708 West 12th Street
Alturas, California 96101

Surface Managing Agency

U.S. Department of Agriculture, Forest Service
Modoc National Forest
800 West 12th Street
Alturas, California 96101

CEQA Lead Agency

Siskiyou County Air Pollution Control District
525 South Foothill Drive
Yreka, California 96097

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Glass Mountain Unit
Geothermal Exploration Project
Environmental Assessment/Initial Study

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Glossary of Acronyms

ACRONYM	DEFINITION
AAQS	Ambient Air Quality Standard
AIRFA	American Indian Religious Freedom Act
APCD	Air Pollution Control District
ATC	Authority to Construct
BEMA	Bald Eagle Management Area
BLM	U.S. Department of the Interior, Bureau of Land Management
BMP	Best Management Practices
BOP	Blow-Out Preventer
BPA	Bonneville Power Administration
CA	California
CAA	Clean Air Act
Cal EPA	California Environmental Protection Agency
CARB	California Air Resources Board
CEGC	California Energy General Corporation
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
cm/sec	Centimeter per Second
CO	Carbon Monoxide
CVRWQCB	Central Valley Regional Water Quality Control Board
d/d	Dead and Downed
dB	Decibel
dBA	Decibels on the A-weighted Scale
dbH	Diameter at Breast Height
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
°F	Degrees Fahrenheit
FEIS	Final Environmental Impact Statement
FESA	Federal Endangered Species Act
FMRP	Freeport-McMoRan Resource Partners
GHC	Good Hiding Cover
GRO	Geothermal Resource Operational Orders
H_2S	Hydrogen Sulfide
ID	Inside Diameter
IP	Interested Parties
IS	Initial Study
KGRA	Known Geothermal Resource Area
LCM	Lost Circulation Material
MF	Marginally Suitable for Foraging
MIS	Management Indicator Species
MMRP	Mitigation Monitoring and Reporting Program
mph	Miles Per Hour
MR	Marginally Suitable for Reproduction
MTC	Marginally Suitable for Thermal Cover
MW	Megawatts
NAHC	Native American Heritage Council
NEPA	National Environmental Policy Act
NRHP	National Register of Historic Places

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ACRONYM	DEFINITION
No.	Number
NO_2	Nitrogen Dioxide
NO_X	Oxides of Nitrogen
NTL	Notice to Lessees
NWC	Naval Weapons Center
O_3	Ozone
OD	Outside Diameter
PAI	Potentially Affected Individuals
Pb	Lead
PM_{10}	Particulate Matter Less Than 10 Microns
POO	Plan of Operation
ppm	Parts Per Million
psi	Pounds per Square Inch
PTO	Permit to Operate
PFR	Primary Forest Route
RMA	Recreation Management Area
RRA	Roadless Release Area
RV	Recreational Vehicle
SCAPCD	Siskiyou County Air Pollution Control District
SF	Suitable for Foraging
SO_2	Sulfur Dioxide
SPL	Sound Pressure Levels
SR	Suitable for Reproduction
STC	Suitable for Thermal Cover
TCH	Temperature Core Hole
TGH	Temperature Gradient Hole
USFS	U.S. Department of Agriculture, Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Department of the Interior, Geological Survey
VQO	Visual Quality Objective

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EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

Project Overview

California Energy General Corporation (CEGC), as Unit Operator of the Glass Mountain Federal Geothermal Unit (14-08-0001-18160), has proposed to implement a Plan of Operation (POO) for exploratory geothermal drilling within the Glass Mountain Known Geothermal Resource Area (KGRA) in the Medicine Lake Highlands, on the Modoc and Shasta-Trinity National Forests in Siskiyou County, California (see Figure 1.1-1). The proposed action would occur on existing U.S. Bureau of Land Management (BLM) geothermal lease lands (Federal Geothermal Leases CA-12367, CA-12370, CA-12371, CA-12372, CA-1224, and CA-2500).

Purpose and Need

The purpose of the proposed action is to investigate and determine the extent and production capacity of the geothermal resource within the lease area and determine if the resource is commercially viable. The need for the proposed action has been established by the Geothermal Steam Act of 1970, the Warren-Alquist Act of 1974, the Federal Land Policy and Management Act of 1976, the Public Utility Regulatory Policies Act of 1978, and the National Materials and Minerals Policy, Research, and Development Act of 1980.

Agency Roles

The BLM has the authority to issue leases for and make determinations on proposed geothermal activities on Federal lands, including National Forest lands. The BLM is therefore the lead Federal agency for the proposed action, and is responsible for conducting an environmental review of the proposed action pursuant to the National Environmental Policy Act (NEPA) and for approving or denying the proposed POO.

Since the proposed action is located on the Modoc and Shasta-Trinity National Forests, the U.S. Department of Agriculture, Forest Service (USFS) is the Surface Managing Agency for

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the proposed action. Before the BLM can authorize any proposed geothermal activities on National Forests, the BLM must consult with the USFS and obtain USFS concurrence. The Modoc National Forest is cooperating with the BLM on behalf of the USFS and is overseeing the preparation of the environmental analysis for the proposed action.

Implementation of the proposed POO would require that CEGC obtain an Authority to Construct (ATC) permit from the Siskiyou County Air Pollution Control District (SCAPCD). The SCAPCD has assumed the role of the state lead agency, and as such is responsible for ensuring that the proposed action complies with the California Environmental Quality Act (CEQA). The Central Valley Regional Water Quality Control Board (CVRWQCB) also has permitting authority for the proposed action.

This document has been prepared as an Environmental Assessment (EA) under NEPA, and as an Initial Study (IS) under CEQA.

Environmental Issues and Concerns

Environmental issues and concerns identified through the scoping process for this EA/IS include the following:

- Effects to regional geology and sustainability of the geothermal resource
- Effects to the Medicine Lake water table and lake level
- Potential to interfere with water supply to Medicine Lake
- Native American concerns
- Effects to vegetation from construction of pads and roads
- Effects to threatened and endangered animal species
- Potential health risks from drilling activities (including the release of gases)
- Wind dispersion of drilling emissions
- Noise from operations
- Preservation of scenic resources
- Potential for conflict with tourism and recreation at Medicine Lake
- Effects on area roads
- Effects on property values and local communities
- Potential for local jobs and use of labor from other areas
- Restoration of pads and roads after the project is completed
- Effects from transmission lines and pipelines
- Potential for large-scale development and siting of a power plant

Alternatives, Including the Proposed Action

ALTERNATIVE A—PROPOSED ACTION

In the proposed POO, CEGC proposes to drill of up to five exploratory geothermal temperature core hole (TCH) wells and to drill, complete, and test deep (production size)

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exploration wells at five well pads within the Glass Mountain KGRA (see Table 1.1-1 and Figure 1.1-2). At least two wells would be drilled at each of the five exploration well pads. The TCH wells would be drilled to a maximum depth of 5,500 feet in order to measure temperature and define lithology. The exploration wells would be drilled to depths of approximately 9,000 feet. These wells have been sited based on regional structural geology and the results of temperature analyses at existing TCH wells that have already been drilled within the Unit Area. Drilling would begin in 1995 and be completed by 1997.

The proposed well sites have been selected to minimize the amount of new surface disturbance. With the exception of well pad 46-32, all well pads would be at least partially located on old log landings, logging roads, or in previously clear-cut areas. TCH well pads would measure approximately 60 feet by 100 feet, and exploration well pads would measure approximately 400 feet by 600 feet. Construction of approximately 2,600 feet of new access roads and improvement to about 8,150 feet of existing access roads would be required to provide vehicle access to the drill sites. Total surface disturbance to construct the well pads and new access roads would be approximately 29.6 acres.

ALTERNATIVE B—ELIMINATION OF WELL PADS NEAR MEDICINE LAKE

Alternative B would involve drilling activities at all well pads identified in the POO with the exception of TCH wells 42-13TCH and 15-15TCH (see Figure 1.1-2). These wells would not be drilled due to public concern over the proximity of the well pads to Medicine Lake. In addition, the old logging skid road to well 42-13TCH would not be improved. All drilling and testing activities and procedures at the other three TCH wells and the five exploration well pads would be the same as described for the proposed action.

ALTERNATIVE C—ELIMINATION OF WELL PADS NEAR MOUNT HOFFMAN

Alternative C would involve drilling activities at all well pads identified in the POO with the exception of exploration well pads 18-32 and 46-32 (see Figure 1.1-2). Exploration wells at these pads would not be drilled due to their suitability as habitat for several species and their location within the Mount Hoffman Roadless Release Area (RRA). In addition, the new access road to well pad 46-32 would not be constructed, and the existing spur road to well pad 18-32 would not be improved. All drilling and testing activities and procedures at the other three exploration well pads and the five TCH well locations would be the same as described for the proposed action.

ALTERNATIVE D—NO ACTION

Under Alternative D (referred to as the "No Action" alternative), the proposed POO would not be implemented. Exploratory drilling and testing of the geothermal resource associated with the POO would not occur.

Environmental Consequences

The following is a summary of the expected environmental effects of the proposed action. For a complete description of all potential effects (as well as proposed mitigation measures), please see Chapter 4 of this document. Section 4.13, Summary of Mitigation

Measures, also identifies the mitigation measures that would be applicable to the proposed action, and a Mitigation Monitoring and Reporting Program (MMRP) for the proposed action is provided in Appendix C.

GEOLOGY AND SOILS

The proposed project may result in a minor increase in erosion at the proposed well pads and access roads. Erosion would be mitigated by engineering practices (see Section 4.13). Construction of pads and roads would result in minor changes in topography, although most of the proposed pads are located on areas that have been previously logged. The site of well pad 58-6 is located at a sufficient distance from the Glass Mountain obsidian flow to avoid effects to this flow (see Section 4.13).

Well blow-outs and the associated effect on project workers are a potential but unlikely hazard of well drilling. Proper material handling would be implemented by CEGC to minimize health risks.

HYDROLOGY

Proposed TCH drilling would require approximately 3,000 to 5,000 gallons of water per day and would take from 25 to 60 days to drill. Exploratory wells would require approximately 9,000 gallons per day and would take from 60 to 90 days to drill; up to 40,000 gallons could be required in lost circulation zones. Water would be obtained from existing sources and would not result in significant depletion of surface or groundwater resources.

Casing and drilling procedures would eliminate the possibility of groundwater contamination from drilling or testing the geothermal resource. The potential for the proposed action to adversely affect Paynes Springs is considered unlikely (see Section 4.13).

CULTURAL RESOURCES

The proposed project would not affect identified cultural or archaeological resources. Mitigation is defined in the event that previously unidentified resources are discovered during construction activities (see Section 4.13).

Native Americans have expressed concerns about the proposed project and the potential to interfere with traditional Native American uses in the region. No specific conflicts with project activities have been identified and no significant impacts are expected to occur due to the limited duration of proposed construction, drilling, and testing activities. Mitigation is proposed to reduce or eliminate potential effects to Native Americans (see Section 4.13).

BIOLOGY

Vegetation

Total surface disturbance at the proposed action would be approximately 29.6 acres. Given the limited acreage of vegetation that would be cleared for the proposed action, the fact

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that 9 of the 10 proposed well pads would be at least partially located on previously logged or cleared areas, and the reclamation that would occur at these facilities, the proposed action would not significantly affect vegetation. Mitigation is proposed to avoid impacts to vegetation from erosion (see Section 4.13).

Construction for well pads and roads would not remove old growth forest but some isolated old growth trees would be removed. CEGC would avoid conifer species over 14 inches dbh where feasible (see Section 4.13).

Geothermal fluids could be deposited on surrounding vegetation during exploration well testing. No significant vegetation effects are expected from this deposition during testing.

Wildlife

The proposed project would result in the loss of habitat that is or may be suitable for sensitive species including:

- Northern spotted owl
- Northern goshawk
- American marten

The expected loss of habitat from implementation of the proposed action would not result in significant impacts to any of the species. Mitigation is proposed to eliminate, reduce, or compensate for impacts to these species (see Section 4.13).

The proposed action would result in the loss of habitat at the well pads and access road corridors for general wildlife species, as well as potential reductions in the use of adjacent habitats. The expected loss of habitat would not result in significant impacts to any general wildlife species. Although some animals may avoid habitats in the vicinity of the proposed action, any avoidance would be temporary. Mitigation is proposed to minimize disturbance of general wildlife habitat in the vicinity (see Section 4.13).

AIR QUALITY

Proposed geothermal drilling and testing would not result in releases of any gases (including hydrogen sulfide (H_2S)) that would exceed standards, result in nuisances, or pose a human health hazard. Emissions during well construction, drilling, and testing would not result in the exceedance of state or federal ambient air quality standards. Fugitive dust emissions will be controlled by watering during construction.

NOISE

Noise from well construction, drilling, and testing would not significantly affect sensitive noise receptors, such as campgrounds and private residences near Medicine Lake. Noise mufflers will be used on project equipment.

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VISUAL RESOURCES

The proposed well pads and roads be visible at certain vantage points. However, the project elements would have a minimal visual impact to long-range views due to their small size and the previous logging disturbance that exists at the sites and throughout the vicinity. Short-range views would also not be significantly affected. The well pads and roads would not be visible from Medicine Lake.

LAND USE, RECREATION, AND TRANSPORTATION SYSTEMS

The proposed action would be consistent with existing land uses, leases, policies, and plans. The well pads and access roads would be noticeable to recreational users throughout the area, but would not result in adverse effects on recreational uses in the Forest. Mitigation is proposed to avoid conflicts with recreational users accessing Medicine Lake (see Section 4.13).

Project roads would be gated and would not open new access. Potential conflicts with traffic around Medicine Lake were identified; proposed mitigation would eliminate conflicts (see Section 4.13).

SOCIOECONOMICS

The proposed project would result in short-term, minor increases in populations and revenues to local businesses by the drilling crews. The project would also present employment opportunities for pad and road construction. The proposed action would generate approximately $1,125,000 to $1,752,500 in salaries for project employees, and would not adversely affect property values of the homes at Medicine Lake.

Unavoidable Adverse Impacts

Based upon the analysis conducted for this document, a number of unavoidable adverse effects were identified. Those impacts that cannot be avoided include:

- Surface disturbance of 29.6 acres, changes in topography, and increased erosion
- Exposure of workers to the potential for natural seismic and volcanic hazards during well construction, drilling, and testing
- Removal of scattered old growth trees and loss of potential habitat for sensitive wildlife species
- Release of air emissions during well construction, drilling, and testing
- Increase in noise during well construction, drilling, and testing
- Views of the proposed action from long-range and short-range viewpoints
- Reduction in the quality of recreation experience in the vicinity of the proposed action during well construction, drilling, and testing
- Temporary increase in traffic from construction-related and operational activities
- Temporary increase in population and employment in the vicinity of the proposed action

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Each of these effects is discussed in detail in Sections 4.2 through 4.10. None of these effects is considered to be significant.

Cumulative Impacts

Two cumulative projects have been identified in the vicinity of the proposed action: the Calpine Fourmile Hill Exploration Program, and the Tuscarora Gas Pipeline. These projects, in conjunction with the proposed action, would be expected to produce cumulative impacts related to geology and soils, hydrology, biology, visual resources, recreation, transportation systems, and socioeconomics. However, none of these impacts would be considered cumulatively significant.

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1: INTRODUCTION

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1: INTRODUCTION

1.1 Project Overview

California Energy General Corporation (CEGC), as Unit Operator of the Glass Mountain Federal Geothermal Unit (14-08-0001-18160), has proposed to implement a Plan of Operation (POO) for exploratory geothermal drilling within the Medicine Lake Highlands on the Modoc and Shasta-Trinity National Forests in Siskiyou County, California (see Figure 1.1-1). All proposed geothermal drilling would occur within the Glass Mountain Known Geothermal Resource (KGRA). The Federal geothermal leases in the Glass Mountain KGRA have been organized into a Federal Unit Area, and CEGC has been designated the Unit Operator. The proposed action would occur on Federal lands that have been leased by the U.S. Bureau of Land Management (BLM) to CEGC or Freeport-McMoRan Resource Partners (FMRP) for the exploration, development, production, and utilization of geothermal resources.

Approval of the proposed action would allow the drilling of up to five exploratory geothermal temperature core hole (TCH) wells and the drilling, completion, and testing of deep (production size) exploration wells at five well pads within the Glass Mountain Unit Area beginning in the summer of 1995. The designations for each of the well pads are presented in Table 1.1-1. The locations of all proposed well pads are shown in Figure 1.1-2.

Table 1.1-1: Proposed Temperature Core Hole and Exploration Well Pad Designations

Temperature Core Holes	Production Test Wells
34-8TCH	18-32
42-13TCH	46-32
11-24TCH	58-6
15-15TCH	56-18
63-20TCH	13-18

SOURCE: CEGC 1994

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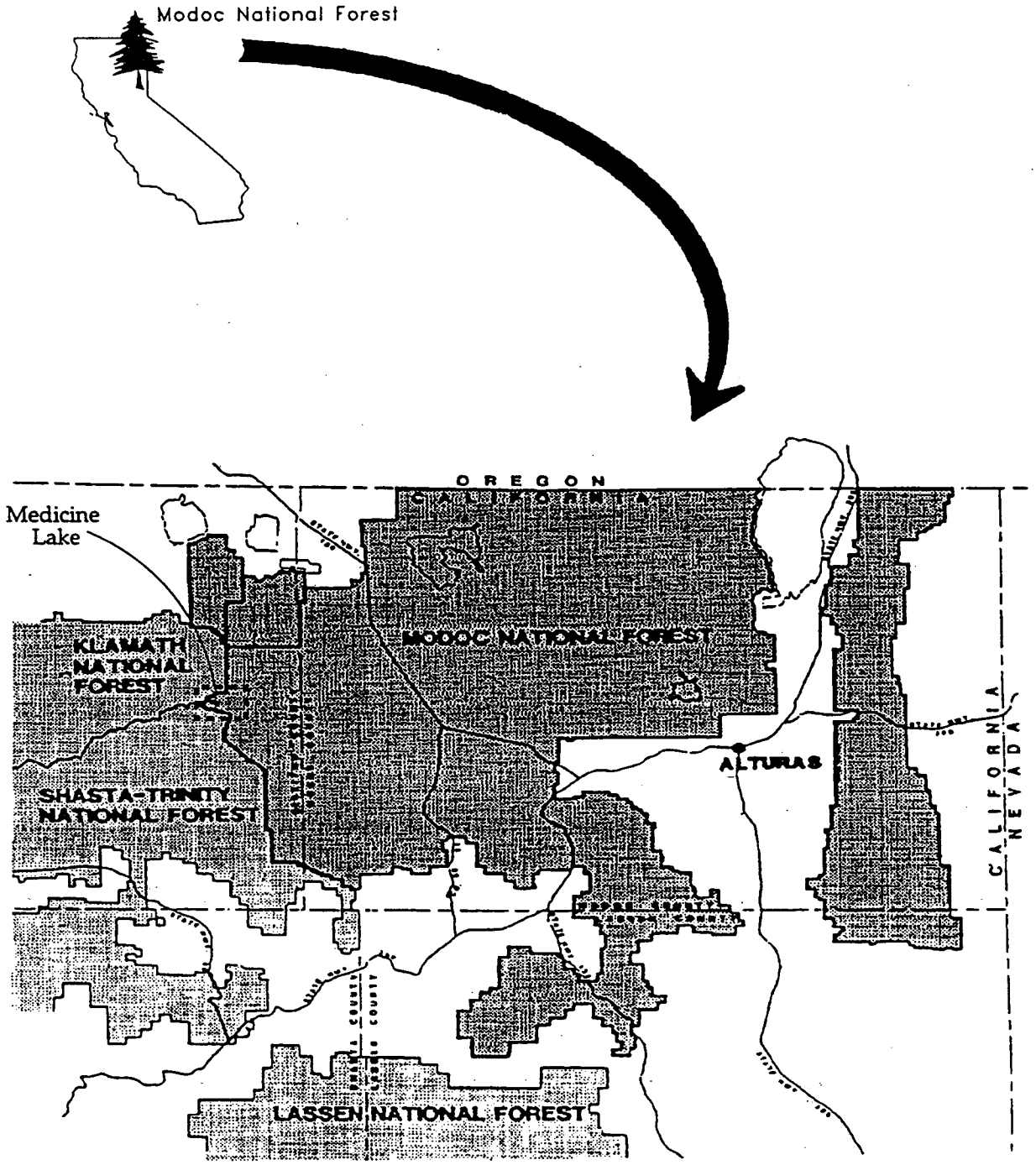
Figure 1.1-1: Regional Area Map



------ Vicinity of the Proposed Action

SOURCE: USFS 1991b

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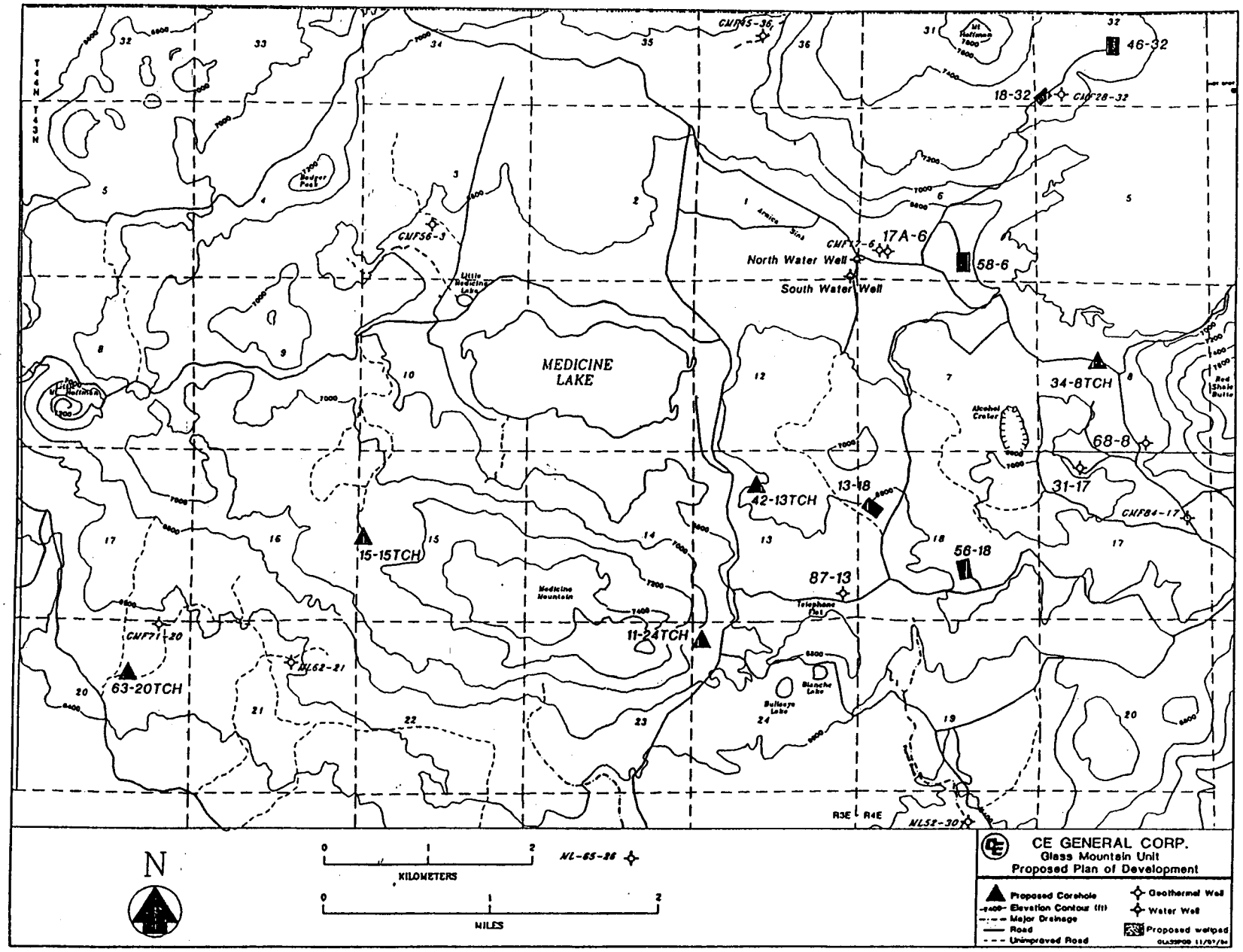
Figure 1.1-2: Temperature Core Hole and Production Test Well Locations



SOURCE: CEGC 1994

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The TCH wells would be drilled to a maximum depth of 5,500 feet in order to measure temperature gradients and define lithology. The exploration wells would be drilled to depths of approximately 9,000 feet. The deep wells have been sited based on regional structural geology and on the results of temperature analyses at existing TCH wells that have already been drilled within the Unit Area.

1.2 Purpose and Need

The purpose of the proposed action is to:

- Investigate the temperature gradient in the lease areas and examine rock formations at depth
- Determine the extent and production capacity of the geothermal resource in these lease areas
- Determine if the geothermal resource in these lease areas is commercially viable and warrants further deep exploration drilling

The need for the proposed action has been established by the U.S. Congress in the Geothermal Steam Act of 1970 and by the California legislature in the Warren-Alquist Act of 1974, both of which encouraged geothermal energy development as a means to diversify energy supplies. In addition, the Federal Geothermal Leases issued by the BLM require diligent exploration. Other acts (including the Federal Land Policy and Management Act of 1976, the Public Utility Regulatory Policies Act of 1978, and the National Materials and Minerals Policy, Research, and Development Act of 1980) also identify the need to develop alternate energy resources.

1.3 Agency Roles

BUREAU OF LAND MANAGEMENT

At the Federal level, the Geothermal Steam Act of 1970 gives the BLM the authority to issue leases for and make determinations on all geothermal activities proposed to be conducted on Federal lands, including National Forest lands. The BLM is therefore the lead Federal agency for the proposed action.

The POO has been submitted by CEGC to the Susanville District, Alturas Resource Area office of the BLM for review and approval. The BLM is responsible for conducting an environmental review of the proposed project pursuant to the National Environmental Policy Act (NEPA) and for approving, approving with modifications, or denying the proposed POO.

FOREST SERVICE

The proposed project is located on the Modoc and Shasta-Trinity National Forests. The U.S. Department of Agriculture, Forest Service (USFS) is therefore the Surface Managing Agency for the proposed action. The BLM and Region V of the USFS have entered into a Memorandum of Understanding (MOU) for coordinating the processing of proposed

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geothermal pre- and post-lease actions on National Forests (BLM and USFS 1989). Before the BLM can authorize any proposed geothermal activities on National Forests, the BLM must consult with the USFS to obtain USFS concurrence. The USFS is responsible for identifying mitigation measures and making recommendations to the BLM for proposed activities.

The USFS, Modoc National Forest is cooperating with the BLM and is overseeing the preparation of this environmental analysis. This environmental document includes the recommendations of the USFS regarding the proposed action.

The POO was submitted by CEGC to the USFS Modoc National Forest Supervisor's office for their information. The Modoc National Forest has reviewed the proposed project and participated in the preparation of this environmental document. The project includes conditions prescribed by the Modoc and Shasta-Trinity National Forests; however, the USFS does not issue a decision on this proposed action. The USFS may issue permits to CEGC for off-lease activities such as well and road use.

SISKIYOU COUNTY AIR POLLUTION CONTROL DISTRICT

Implementation of the proposed POO would also require that CEGC obtain applicable permits from the local air district. The proposed project would include the emission of geothermal steam to the atmosphere during drilling and testing; therefore, the Siskiyou County Air Pollution Control District (SCAPCD) would have the authority to issue an Authority to Construct (ATC) permit for the proposed action. The SCAPCD has assumed the role of the state lead agency, and as such is responsible for ensuring that the proposed action complies with the California Environmental Quality Act (CEQA). This environmental document will be evaluated by the SCAPCD to determine whether to issue a permit to CEGC for the proposed action.

CENTRAL VALLEY REGIONAL WATER QUALITY CONTROL BOARD

The Central Valley Regional Water Quality Control Board (CVRWQCB) has jurisdiction over waste discharge to land and is responsible for issuing permits for discharging fluids to well pad sumps and injection of geothermal fluids. In 1991, the CVRWQCB issued a permit to the USFS and Union Oil Company of California (Unocal) for geothermal exploration on leases within the Glass Mountain KGRA (see Section 1.4, Project History). The leases addressed in the permit have since been transferred to CEGC. The issued permit covers the area of the proposed action. CEGC proposes the same geothermal activities for the area covered by the CVRWQCB permit as those proposed by the USFS and Unocal. CEGC has therefore requested that the CVRWQCB permit be reissued to CEGC for the proposed action. The CVRWQCB will use this environmental document to facilitate their review of CEGC's request for a reissued permit.

NEPA/CEQA

Since implementation of the POO would require approvals from both Federal and local agencies, the proposed action is subject to environmental review pursuant to NEPA and CEQA. This document has therefore been prepared as both an Environmental Assessment

(EA) in order to meet the requirements of NEPA, and as an Initial Study (IS) under CEQA. An Initial Study Checklist is included in this EA/IS as Appendix A.

This environmental document has been prepared by a third-party consultant under the direction of the lead and surface managing agencies, in accordance with BLM guidelines (see Chapter 5).

1.4 Project History

PREVIOUS GEOTHERMAL ACTIVITIES

The proposed action would be located within the Glass Mountain Unit Area (see Figure 1.4-1), which was originally designated in the Unit Agreement for the Glass Mountain KGRA that was approved by the BLM in 1982. Unit Agreements provide for a cooperative plan among responsible agencies and geothermal exploration companies to explore and potentially develop a geothermal resource. At the time that the Unit Agreement was approved, Unocal was designated as the Unit Operator. Other major lease holders in the Unit Area were Occidential Geothermal, Inc. and Phillips Petroleum Company.

Subsequent to approval of the Unit Agreement in 1982, there have been several changes in the geothermal exploration companies interested in exploring the geothermal resource within the Glass Mountain Unit Area. By 1988, the primary lease holders within the Unit Area were Unocal and Freeport-McMoRan Resource Partners (FMRP). In 1993, CEGC acquired the Unocal leases within the Unit Area and was designated the Unit Operator. In 1994, FMRP designated Calpine Corporation as its agent for geothermal exploration at the Unit Area (FMRP still holds the leases). Current lease holdings within the KGRA are illustrated in Figure 1.4-1.

Extensive investigations and geophysical surveys of the geothermal resource have been conducted within the Glass Mountain Unit Area since the Unit Agreement was approved in 1982. A total of 24 TCH wells were drilled in the Unit Area between 1981 and 1984 (the first phase of exploration). These wells were drilled by Unocal, Phillips Petroleum, and Occidential Geothermal, and were used to measure the temperature gradient in the Unit Area.

Based on the results of the temperature gradient drilling, drilling of deep exploration test wells (the second phase of exploration) was initiated in 1984 when Phillips Petroleum and Occidential Geothermal drilled a deep exploration test well at well pad 17A-6 (see Figure 1.1-2). Unocal drilled three additional deep exploration test wells between 1985 and 1991 (well pad 68-8 was drilled in 1985, well pad 31-17 was drilled in 1988, and well pad 87-13 was drilled in 1989 and deepened in 1991).

PREVIOUS ENVIRONMENTAL DOCUMENTATION

In 1981, the BLM proposed to issue several geothermal leases within the Glass Mountain KGRA for the purpose of exploring, developing, and utilizing the geothermal resource

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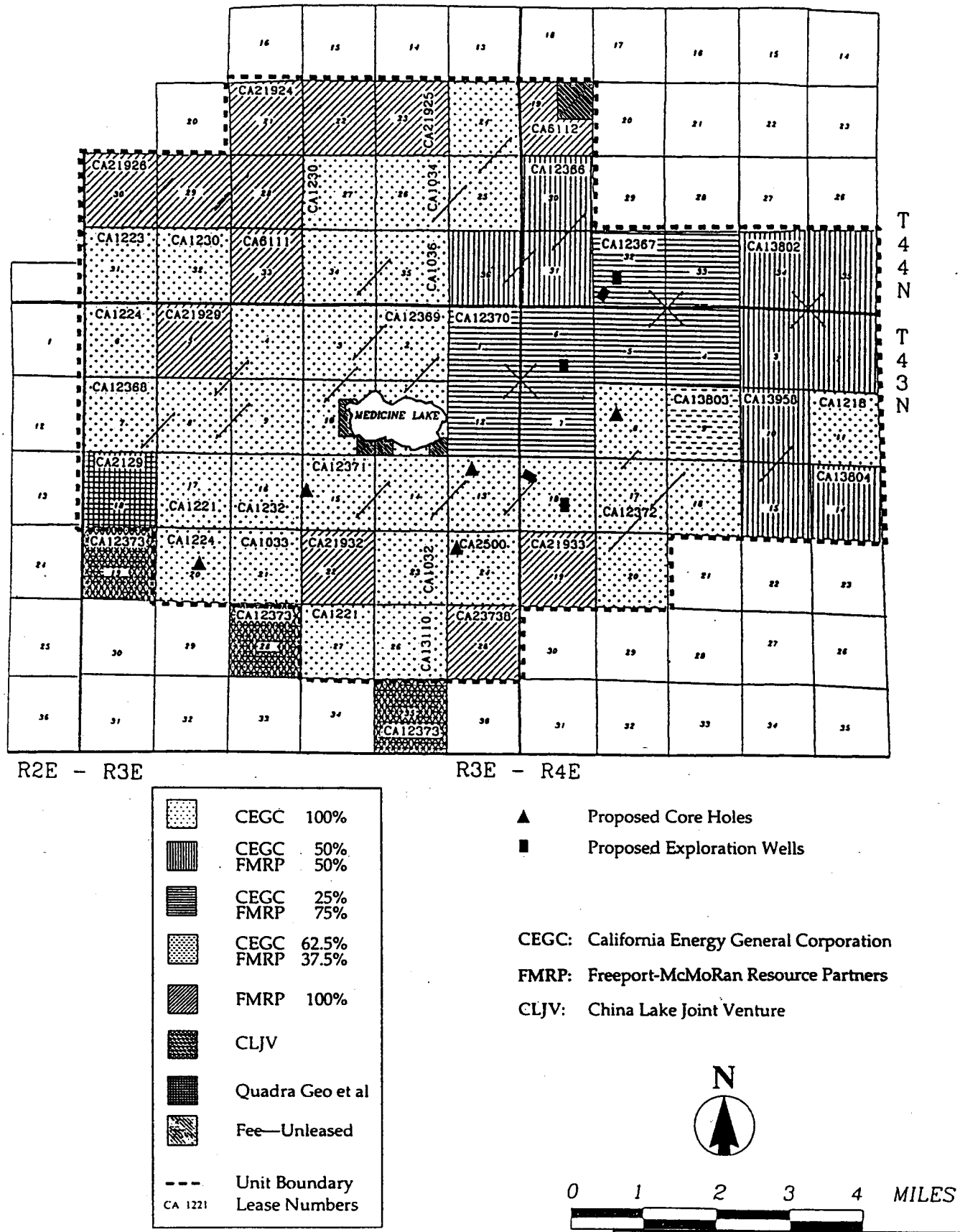
Figure 1.4-1: Glass Mountain KGRA Lease Holdings



SOURCE: CEGC 1994

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within the KGRA. As part of the authorization process for this leasing, the BLM and the USFS jointly prepared and issued an EA for the "casual use and exploration" of the geothermal resource within the KGRA (BLM and USFS 1981). In 1984, the EA was supplemented to analyze additional potential geothermal leases from expansion of the KGRA and to address the potential environmental effects associated with exploration, development, production, and utilization of the geothermal resource (BLM and USFS 1984). The leases that were issued explicitly provide for the exploration, development, production, and utilization of the leases. The leases that the proposed action is located on also carry special stipulations that CEGC must comply with prior to implementation of any proposed POO (see the discussion of geothermal lease stipulations in Sections 3.9 and 4.9 of this document).

In 1991, the USFS prepared a Land and Resource Management Plan for the Modoc National Forest (USFS 1991a). This Management Plan provides guidance on natural resource management activities and establishes management standards and guidelines for the Modoc National Forest. As part of the environmental review process for the Management Plan, the USFS prepared a Final Environmental Impact Statement (FEIS) that discusses the environmental consequences of the Plan and acknowledges the potential for geothermal development on the Forest (USFS 1991b).

The 1981 EA, 1984 Supplemented EA, 1991 Management Plan, and 1991 Management Plan FEIS are available for review at the USFS, Modoc National Forest Supervisor's office in Alturas, California. These documents are herein referenced and summarized where appropriate.

In 1994, Calpine Corporation (as designated agent for FMRP) proposed to drill two temperature gradient wells on Lease CA-21926. The impacts of these wells were addressed in an EA prepared by the BLM, Alturas Resource Area Office (BLM 1994).

1.5 Environmental Issues and Concerns

Prior to preparation of this EA/IS, the USFS notified responsible agencies, Native American groups, and the public of the proposed action in order to identify environmental issues to be addressed in the EA/IS. As part of the scoping process for the EA/IS, a notification letter was issued by the USFS to approximately 110 Interested Parties (IP) and Potentially Affected Individuals (PAI) on September 23, 1994. The IP/PAI letter summarized the actions proposed in the POO and requested that any comments or concerns regarding the POO be expressed in writing and submitted to the USFS by November 1, 1994.

A total of 44 responses to the IP/PAI letter were received by the USFS (see Appendix B). Of these responses, 14 contained comments addressing the POO; the remaining 30 letters were requests to be kept informed about project developments by the USFS. This EA/IS presents an analysis of the environmental consequences of the proposed POO and addresses concerns regarding the POO that were raised during the scoping process. The

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following is a summary of the environmental issues that were identified through the scoping process.

GEOLOGY AND THE GEOTHERMAL RESOURCE

Of concern to the public are effects to regional geology from implementation of the proposed POO. The public also expressed concern over how the proposed action would affect the sustainability of the geothermal resource. These topics have been addressed in Section 4.2 of this EA/IS.

MEDICINE LAKE WATER TABLE AND LAKE LEVEL

The public expressed concern over how implementation of the proposed POO would affect the water table and lake level at Medicine Lake, due to the proximity of the proposed action to the lake. These topics have been addressed in this EA/IS, Section 4.3.

MEDICINE LAKE WATER SUPPLY

Drilling operations under the proposed POO would require water use. The potential for the proposed action to interfere with the supply of water to Medicine Lake has therefore been identified as an environmental issue, and this topic has been addressed in Section 4.3.

NATIVE AMERICAN CONCERNS

The vicinity of the proposed POO is an area that is used by several Native American groups, primarily for spiritual and cultural heritage purposes. The USFS and BLM have conducted three meetings and one site visit with Native American groups to solicit Native American concerns regarding the proposed action. These concerns are addressed in Sections 3.4 and 4.4 of this EA/IS.

VEGETATION EFFECTS

Of concern to the public is the amount of surface disturbance from implementation of the proposed POO, and the acreage of vegetation that would be removed for construction of well pads and roads. This topic has been addressed in Sections 3.5 and 4.5 of this EA/IS.

THREATENED, ENDANGERED, AND SENSITIVE ANIMAL SPECIES

The proposed action would be located on a National Forest that provides habitat for a variety of animal species. The potential for the proposed action to affect threatened, endangered, and sensitive animal species in the project vicinity has been identified as an environmental issue. Of particular concern are proposed drilling activities at well pads that are located in more isolated areas and that provide habitat for special status animal species. This topic has been addressed in this EA/IS, Section 4.5.

POTENTIAL HEALTH RISKS

The public expressed concern over potential health risks from drilling activities that would occur under the proposed POO. Of particular concern is the potential release of gases from drilling and well testing activities, and how these gases would affect residences near Medicine Lake. This topic has been addressed in Sections 4.2 and 4.6 of this EA/IS.

WIND DISPERSION OF DRILLING EMISSIONS

Geothermal drilling under the proposed POO would emit geothermal steam to the atmosphere. The public expressed concern about the potential for these emissions to affect vegetation and the public (particularly residences near Medicine Lake) through wind dispersion of the geothermal emissions. This topic has been addressed in Sections 4.5 and 4.6 of this EA/IS.

NOISE

The public expressed concern about the level of noise that would be generated by project operations under the proposed POO, and how these noise levels would affect residences near Medicine Lake. This topic has been addressed in this EA/IS, Section 4.7.

SCENIC RESOURCE PRESERVATION

The public expressed concern about how implementation of the proposed POO would affect scenic resources in the project vicinity. This topic has been addressed in Section 4.8.

TOURISM AND RECREATION CONFLICTS

Of concern to the public is the potential for geothermal exploration activities allowed under the proposed POO to conflict with tourism and recreation at Medicine Lake. This topic has been addressed in Section 4.9 of this EA/IS.

TRANSPORTATION SYSTEMS

The public expressed concern over how implementation of the proposed POO would affect roads in the project vicinity. Specifically, the public is concerned with the maintenance of any roads to be used by traffic generated by the proposed action and the potential for winter clearance of roads in the vicinity. These topics have been addressed in Section 4.9 of this EA/IS.

EFFECTS ON PROPERTY VALUES AND LOCAL COMMUNITIES

Comments were received regarding the potential for implementation of the proposed POO to affect property values in the project vicinity (particularly residential property near Medicine Lake), as well the potential effect of implementation of the proposed project on local communities. These topics have been addressed in Section 4.10 of this EA/IS.

LOCAL JOBS AND USE OF LABOR FROM OTHER AREAS

The proposed action would generate employment in the project vicinity. Of concern to the public is how many local jobs would be created and how much of the labor force would be brought in from other areas. This topic has been addressed in Section 4.10.

PAD AND ROAD RESTORATION

The public expressed concern over how restoration of well pads and roads would occur upon completion of the proposed POO. This topic has been addressed in Chapter 2 of this EA/IS.

LARGE-SCALE/POWER PLANT DEVELOPMENT

The public expressed concern about the potential for large-scale development and siting of a power plant under the proposed POO. While CEGC believes that there are substantial geothermal resources within the Glass Mountain KGRA (based on previous exploratory drilling), it is uncertain at this time whether a commercially viable geothermal resource actually exists. Only exploratory geothermal drilling and testing is therefore proposed in the POO, and no utilization or development of the geothermal resource within the KGRA is proposed.

Since it is not reasonably foreseeable at this time that utilization or development of the geothermal resource would occur as a result of the proposed POO, this EA/IS addresses only the activities described in the POO. This approach is consistent with Section 21090.1 of the CEQA Statutes, which specifies that an exploratory geothermal project should be deemed to be separate and distinct from any subsequent geothermal field development. An analysis of geothermal activities beyond those described in the POO would be considered speculative at this time, and this topic has not been addressed in this EA/IS.

If a commercially viable geothermal resource is discovered within the Glass Mountain KGRA, utilization and development of the geothermal resource would require the preparation of separate Plans of Development and Utilization. These future plans (if warranted) would describe detailed plans for construction and operation of geothermal facilities such as a power plant, transmission lines, and a development well field. Similar to the POO, these plans would be subject to environmental review and public comment.

TRANSMISSION LINES AND PIPELINES

The public expressed concern over potential effects from development of transmission lines and pipelines under the proposed POO. The effect of installing pipelines to transport water and sump contents has been addressed in this EA/IS (see Section 4.2 and 4.5). Since transmission lines are not proposed to be installed under the POO (only exploratory geothermal drilling and testing is proposed in the POO), this topic has not been addressed in this EA/IS.

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2: ALTERNATIVES, INCLUDING THE PROPOSED ACTION

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2: ALTERNATIVES, INCLUDING THE PROPOSED ACTION

2.1 Alternative A—Proposed Action

LOCATION

The proposed action would be located within the Glass Mountain KGRA in the Medicine Lake Highlands, on the Modoc and Shasta-Trinity National Forests in Siskiyou County, California (see Figure 1.1-1). On the Modoc National Forest, activities would occur in the Double Head Ranger District; on the Shasta-Trinity National Forest, activities would occur in the McCloud Ranger District. Only 63-20TCH would be located on the Shasta-Trinity National Forest. The proposed action is the implementation of a POO for exploratory geothermal activities that would include drilling of up to five exploratory geothermal TCH wells and drilling, completion, and testing of deep (production size) exploration wells at five well pads, as shown in Figure 1.1-2. The proposed action would be located on Federal Geothermal Leases CA-12367, CA-12370, CA-12371, CA-12372, CA-1224, and CA-2500.

OBJECTIVES

The primary objective of the POO is to complete sufficient geothermal exploratory drilling to define and delineate a reserve of commercially viable high temperature geothermal resources that would allow for production to support a commercial geothermal power plant. The activities proposed in the POO are intended to locate and test a geothermal reservoir capable of supporting a minimum 100 megawatt (MW) power plant. At this time, exploratory drilling is necessary to determine if such a geothermal resource exists within the Glass Mountain KGRA. The proposed drilling activities identified in the POO

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are the minimum necessary to allow for an adequate delineation of the geothermal resource.

The proposed action would also be intended to advance the exploration program at the Glass Mountain KGRA to the resource evaluation phase, based on a thorough geological evaluation of subsurface geological data and geothermal potential. By implementing the POO, CEGC intends to bring the exploration program to the next logical business decision point, that of testing productivity and commercial development.

Based on existing well data, surface geology, and geophysical surveys, CEGC believes substantial geothermal resources may exist in the KGRA. The exploration and well testing program identified in the proposed POO is designed to gather the temperature, stratigraphic, and reservoir data necessary to determine whether development of the resource is warranted.

DESCRIPTION OF THE PROPOSED ACTION

Summary

The proposed POO would allow the drilling of up to five exploratory geothermal TCH wells and the drilling, completion, and testing of deep exploration wells at five well pads. The TCH wells would be drilled to a maximum depth of 5,500 feet in order to measure temperature and define lithology. The exploration wells would be drilled to depths of approximately 9,000 feet. These wells have been sited based on regional structural geology and the results of temperature analyses at existing TCH wells.

The proposed well sites have been selected to minimize the amount of new surface disturbance. With the exception of well pad 46-32, all wells would be at least partially located on old log landings, logging roads, or in previously clear-cut areas. Well drilling operations would require construction of five well pads measuring approximately 60 feet by 100 feet for the core holes and five well pads measuring approximately 400 feet by 600 feet for the deep exploration wells. Construction of approximately 2,600 feet of new access roads and improvement to about 8,150 feet of existing access roads would be required to provide vehicle access to the drill sites. Total surface disturbance from establishment of the well pads and new access roads would be approximately 29.6 acres. Improvements to existing access roads would range from minor road widening and realignment to clearing re-emergent vegetation within the road.

Operating Procedures

All proposed drilling operations under the POO (including siting of wells, proposed drilling depth, casing and cementing, safety procedures, well plugging and abandonment, and environmental protection) are governed by and would comply with the Federal Geothermal Resources Operational Orders (GROs) Nos. 1-5 administered by the U.S. Bureau of Land Management (BLM).

In addition to the GROs, all drilling operations would be conducted in compliance with specific stipulations of the USFS and BLM permits and leases under the operating

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procedures and identified in this EA/IS, access procedures and conditions issued by the USFS, Modoc National Forest, and the BLM's October 1, 1985 Notice to Lessees (NTL) CA-86-01. The NTL CA-86-01 contains requirements for drilling deep temperature gradient holes in the State of California and provides the general parameters for deep temperature core hole drilling that would be conducted as part of the POO.

CEGC has also prepared a Detailed Drilling and Testing Program (CEGC 1994) that contains procedures for operations on BLM leases, as well as an Emergency Contingency Plan and General Safety Practices for drilling operations. Both of these plans would be followed during drilling operations under the POO. These plans are available for review at the BLM Alturas Resource Area Office and the USFS Modoc National Forest Supervisor's office in Alturas, California.

Hard hats would be worn by all personnel during construction and drilling at the well sites. OSHA regulations would be followed by all personnel. Drinking water and sanitary facilities would be provided for personnel by CEGC. Persons not directly involved in the proposed operation would be restricted from the well pads (hard hat area).

Proposed Drill Site Locations

The locations of proposed TCH and exploration well pads were defined based upon results of previous geological and drilling investigations in the area. The five TCH well pads are the minimum necessary to adequately investigate the geothermal resource. These wells have been sited to further delineate the characteristics of the regional geothermal heat flow in the area and to assist in prioritizing the order of drilling for the deep test wells. The TCH well pads have all been sited on previously disturbed areas on old log landings or skid roads.

The five exploration well pads have been placed at the sites anticipated to be near the most promising temperature gradient and structural features that may result in favorable geologic conditions, based on the results of previously-approved temperature gradient well testing. All exploration well pads except for pad 46-32 have been at least partially sited on old log landings, logging roads, or in previously clear-cut areas.

Well Pad Access and Road Construction

Table 2.1-1 identifies the proposed road access to the TCH and exploration well pad sites. The majority of the pads are on existing USFS or logging roads. Two of the 10 pads would require the construction of new access roads. Pad 46-32 would require construction of 2,200 feet of new road. 42-13TCH would require 400 feet of new road, and 1,100 feet of improvements on existing logging roads. Roads would require varying levels of construction activities to establish or improve the roads for vehicle access. Typical improvements would include grading, road widening, vegetation clearance, and widening of turns. CEGC has proposed to install gates on certain access roads or pad entrances to control vehicle access to well pads. Proposed access road gates are shown on Figure 1.1-2. All gates would have dual locks to allow access to BLM and USFS personnel.

Table 2.1-1: Well Site Access and Required Road Construction

Temperature Core Holes	Access and Required Road Construction
34-8TCH	150-foot long old logging road connects an existing gravel road to the site; logging road needs to be recut
42-13TCH	Requires construction of a 1,500-foot access road from an existing dirt road to the site; access road would generally follow the route of an old logging skid road
11-24TCH	400-foot long old logging road connects the pad to an existing paved road (Powder Hill Road); logging road needs to be recut
15-15TCH	Unimproved spur road connects the pad to an existing road (Medicine Lake-Mount Hoffman Road); no road construction required
63-20TCH	Unimproved spur road connects the pad to an existing road to the site; no road construction required
Production Test Wells	
18-32	Unimproved spur road to the existing well 28-32 connects an existing road (Arnica Sink Road) to the site (well pad 18-32 would be partially constructed on the spur road); 5,000-foot long portion of the single-lane spur road near the site would require improvements for drainage, turning radius, and turn-outs
46-32	Requires construction of a new 2,200-foot access road with turnouts from the end of the existing unimproved spur road at pad 18-32 to the site
58-6	1,000-foot long old logging skid road connects an existing unimproved spur road to the site; requires construction of an access road that would follow the route of the skid trail
56-18	500-foot long old logging skid road connects an existing paved road (Tionesta Road) to the site; requires construction of an access road that would follow the route of the skid trail
13-18	Located along an existing unimproved spur road; no road construction required

SOURCE: CEGC 1994

Improved and new access roads to the TCH and exploration well pads would be designed and constructed in accordance with USFS specifications and with good engineering practices. Access roads would be constructed as Class D 14-foot wide single-lane resource roads; in some areas, a maximum 22-foot width would be necessary for turnouts and portions of the roads on slopes that require cut and fill. Roads would be similar in design to those that are used for logging and other timber harvest activities throughout the Modoc National Forest.

The access roads to well pads 46-32, 58-6, and 42-13TCH would be constructed by building graded dirt spur roads similar to the existing spur road to the existing well pad 28-32 (see

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Figure 1.1-2). These access roads would be functionally classified by the USFS as single-lane resource roads with the following general design specifications:

- Design speed of 15 to 20 miles per hour (mph)
- Maximum grade of 8 to 16 percent
- Travel way width of 14 feet
- Maximum 22-foot total cleared width in certain locations for turnouts and cut and fill

Gravel and other road materials necessary for improvement and construction of roads are present at the road sites, and no additional material would be required for road work. To minimize dust generation during access road grading and construction, water would be applied to road construction areas as necessary. The water would be trucked from existing water wells in the Arnica Sink area (see Figure 1.1-2 for water well locations).

Specific details of proposed road construction are included in the CEGC Geothermal Sundry Notice that will be submitted to the BLM. Prior to actual drilling at the TCH and exploration well pads, CEGC would obtain a road use permit from the USFS for vehicle travel on area roads.

Drilling activities at each TCH well would be expected to generate a maximum of six to eight round trips per day, which includes two to four water truck deliveries. Monitoring at each TCH well would generate about three or four round trips per day. At the exploration wells, each well site would generate approximately 20 round trips per day during drilling and about four round trips per day during testing.

TCH Wells

Figure 2.1-1 illustrates a typical drilling rig and facility layout for TCH wells. Each TCH well site would occupy an area measuring approximately 60 feet by 100 feet. Since the proposed TCH well sites have been previously disturbed and are relatively level, significant cut and fill operations to develop the TCH facilities at these sites would not be necessary. The pads would need to be cleared of any remaining vegetation prior to drilling activities.

Facilities and Equipment: As shown in Figure 2.1-1, typical equipment at each TCH well site would include the truck-mounted drilling rig, casing storage area, a water storage tank, two emergency water tanks (known as "Baker" tanks), a fuel storage tank, a small office/supply trailer, and personnel vehicles. The drilling cores would be stacked at the site and periodically removed to storage off-site. The pad would also include an excavated reserve pit approximately 10 feet wide by 25 feet long by 8 feet deep. Upon completion of the TCH, all support facilities would be removed, the reserve pit would be filled in, and the site would be regraded.

Noise mufflers would be used on all rig engines and air compressor engines. All equipment would be properly maintained and muffled to ensure compliance with the

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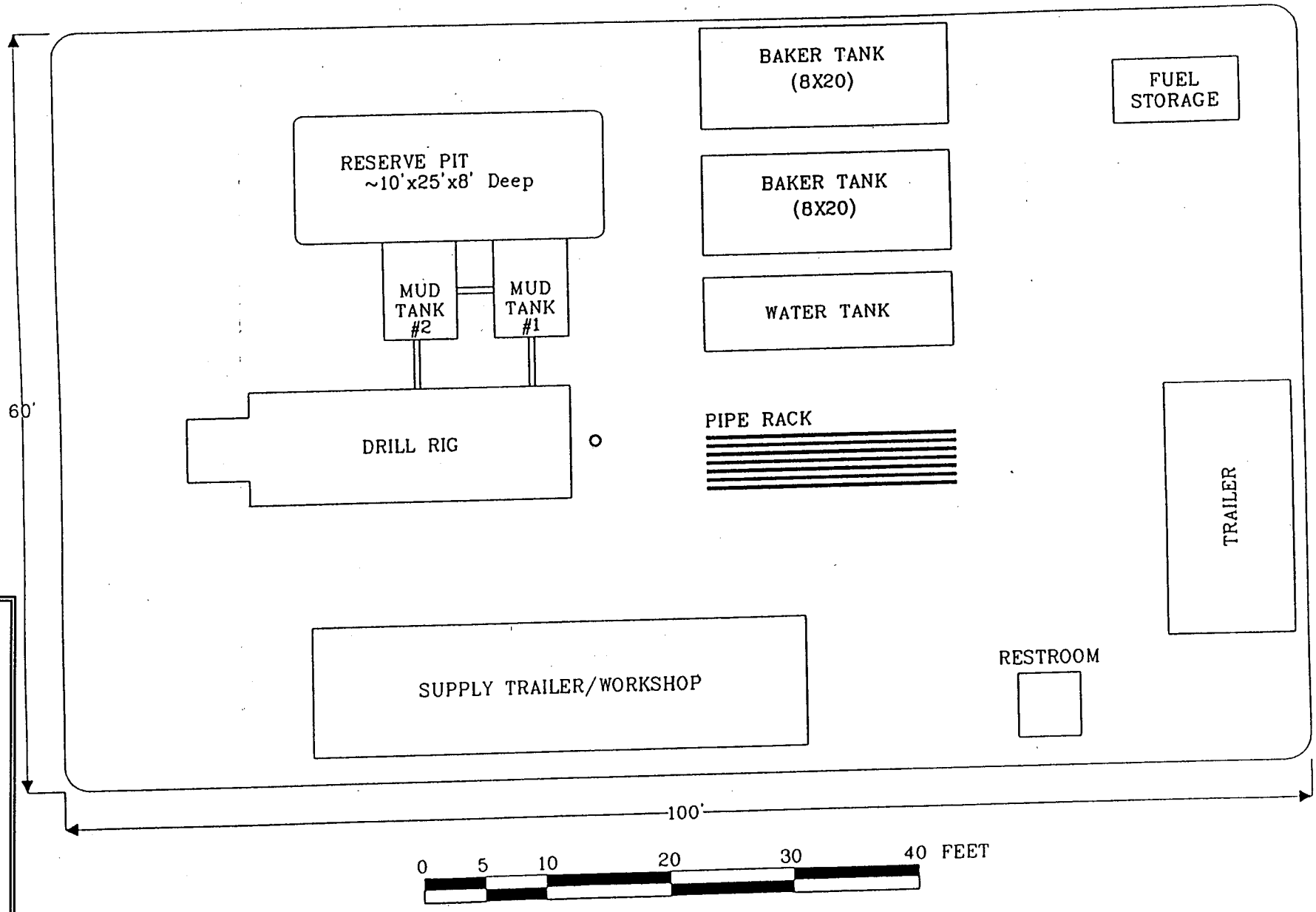
Figure 2.1-1: Typical Rig and Facility Layout for TCH Well Sites



SOURCE: CEGC 1994

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Federal Occupational Safety and Health Act of 1970 and GRO No. 4. All potential spark-emitting equipment would be fitted with spark arresters to meet fire standards.

Electrical power for drilling and testing operations would be provided by portable diesel generating equipment. Mobile telephone and radio communications would be maintained between operating personnel in the field, CEGC's offices in Portland, Oregon and CEGC's technical center in Ridgecrest, California.

Portable sanitary facilities for personnel would be provided and maintained in accordance with state and Federal health standards. Non-hazardous solid waste such as paper, cans, packing materials, etc. would be collected on-site in an approved receptacle and disposed of at a public disposal facility or other approved disposal location.

Drilling and Coring Procedures: Under the drilling program proposed in the POO, an 8-inch hole would be rotary drilled at the TCH well sites with mud, aerated mud, or air-foam (depending on subsurface conditions encountered) to at least 10 percent of total depth and cementing 4.5-inch casing to the surface. Below the surface casing, the hole would be completed using standard diamond drilling core equipment. This coring process provides detailed geologic information while requiring relatively low volumes of drilling fluid. This coring process also allows hole completion without total fluid circulation, which is critical in volcanic terrains.

Drilling procedures at each TCH well site would be as follows:

1. Construct access roads, TCH pad, and reserve pit
2. Move in and rig up a rotary core rig
3. Spud 8-inch nominal hole and drill to approximately 550 feet using a mud, aerated mud, or air-foam drilling fluid
4. Cement 4.5-inch casing to approximately 550 feet
5. Depending on the site-specific conditions at the TCH well, either build a 5-foot by 5-foot by 7-foot cellar or place the rig on a stand to complete rigging up core rig
6. Weld on casing head flange. Nipple up 4.5-inch blow-out preventers (BOP), and install a blind ram and hydraulic operated annular B.O.P. and kill and choke lines. Pressure test all equipment to 500 pounds per square inch (psi), with advance notification to BLM to witness test
7. Install hydrogen sulfide (H_2S) indicator and alarm system
8. Drill out cement plug to below 4.5-inch casing shoe
9. Start core drilling with 2.5-inch ID by 3.78-inch OD wireline coring system, circulating with bentonite mud. Reduce core size as mandated by drilling conditions. As needed, run maximum recording thermometer to bottom of hole at 100-foot intervals to evaluate temperature
10. At completion, run 1.5-inch tubing to total depth; fill with water and cap. Clean up drill pad, fill in or fence reserve pit as appropriate
11. Run periodic temperature surveys up to one year after completion

12. After completion of temperature surveys, plug and abandon the hole in conformance with GROs and stipulations of the BLM.

Well Completion and Abandonment: Upon completion of the TCH, the wellhead gate valve would be chained and locked, or a locking bonnet will be placed over the wellhead cellars to prevent unauthorized corehole entry. Wellhead cellars would be covered with heavy duty timber material and nailed shut. Periodic inspections of the site would be conducted except during periods of winter snows. After completion of all testing, and prior to actual abandonment operations, a proposal for abandonment of the TCH wells, in compliance with GRO No. 3, would be submitted to the BLM and USFS for review and concurrence (see the discussion of reclamation on page 2-17 of this EA/IS).

Exploration Wells

Figure 2.1-2 illustrates a typical drill pad layout (with two wells) for exploration well sites. Well pads are designed to accommodate additional wells for exploration that could be drilled if the currently proposed wells do not provide enough information to determine commercial viability of the geothermal resource. The well pads could be used for development of the geothermal resource if the resource proved to be commercially viable.

Each test well site would occupy an area measuring approximately 400 feet by 600 feet. This area would need to be cleared of vegetation for drilling activities. With the exception of well pad 46-32, at least a portion of each of the proposed test well sites has been previously disturbed, generally through logging or other geothermal exploration activities. Individual Sundry Notices would be filed with BLM (with a copy to USFS) prior to construction of each exploration well pad.

All test well sites would require varying degrees of cut and fill operations to establish the drilling facilities, minimize erosion, and provide slope stability at these sites. Well pad sites would be graded and compacted to prevent accelerated erosion or gullying in the vicinity of the well pads. In addition, berms, culverts, and other water-control methods would be used. Upon abandonment, well pads would be regraded to original contours and allowed to revegetate.

Facilities and Equipment: Each well pad is designed to accommodate the drilling of a minimum of two exploration wells. Industry standard geothermal rotary drilling rigs equipped with H_2S monitoring devices and blow-out preventers (BOP) would be used to drill the wells. As shown in Figure 2.1-2, typical equipment at each test well pad would include the drilling rig, pipe racks, generators, air compressors, office and supply trailers, and a fuel storage tank. Personnel vehicles and subcontractor and supplier trucks and vehicles would occasionally be present at the well pads.

Noise controls, fire protection, electrical power and communications, and sanitary facilities and non-hazardous solid waste disposal for the exploration wells would be conducted as described for the TCH wells. In addition, the air, rock, and steam returns during air drilling would be directed by a pipe (known as the "blooie line") from the well to a separator/muffler to reduce noise from drilling operations to a minimum. Exhaust

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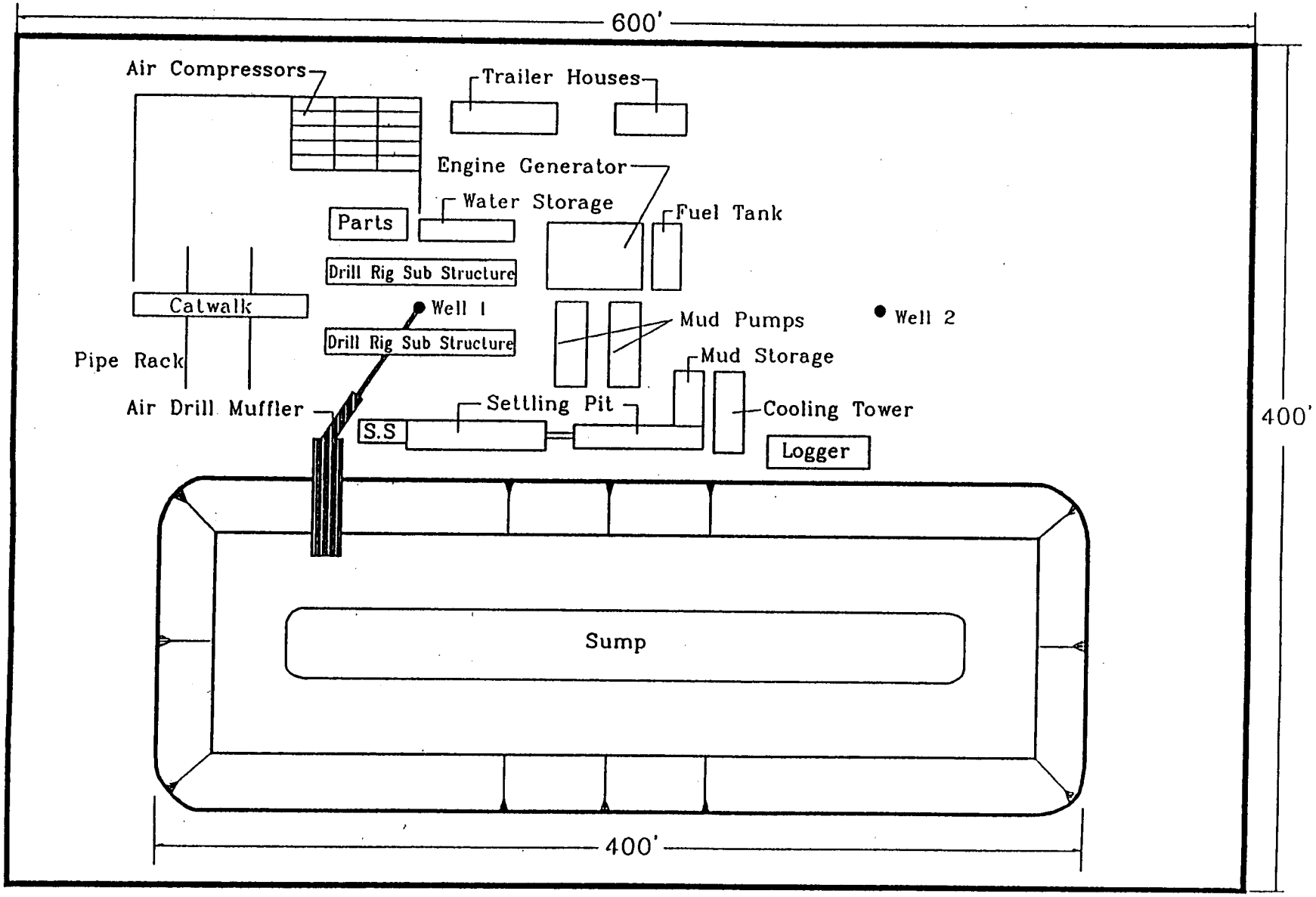
Figure 2.1-2: Typical Drill Pad Layout for Exploration Well Sites



SOURCE: CEGC 1994

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stacks on all diesel or gas-driven equipment and vehicles would be equipped with mufflers to minimize air emissions. For air drilling, injected water and a cyclone separator/muffler would be used to control particulates.

Sumps: In addition to drilling facilities, a sump with a capacity of 750,000 to 1,000,000 gallons would be constructed at each test well pad (see Figure 2.1-2). The sumps would be compacted during construction and lined with either clay or an approved plastic liner, either of which would prevent percolation and provide an impermeable layer in the sumps. The lining of the sump would have an estimated maximum permeability of 1×10^{-6} centimeters per second (cm/sec.). The test well pads would be bermed to allow for drainage into the sump.

During the drilling and testing operations, drilling muds and produced fluids would be collected in sumps, reserve pits, or other containers. It is expected that the sumps (750,000 to 1,000,000 gallons) would be adequately sized to hold the volumes of fluids produced during the initial short-term rig flow test, and the longer reservoir flow testing. If the well pad sump is not adequately sized to handle all fluids produced during short-term or long-term testing, the following options for handling excess fluids would be considered:

- Piping or trucking of fluids to nearby sumps
- Piping of fluids to an injection well should one be available
- Stop testing

Concurrence of the BLM and USFS would be obtained before initiating the first or second of these options. If trucks are used to transport excess fluids, these trucks would not use paved recreational travel routes, and appropriate maintenance would be provided by CEGC for haul roads that would be used.

Sump contents would not be considered hazardous. Upon completion of drilling and testing operations, sump contents would be tested. Once testing confirms the contents to be non-hazardous, the contents would be allowed to desiccate, and the sump would be filled in and revegetated or allowed to revegetate if the sump is not needed for further drilling operations. In the unlikely event that testing determines the sump contents to be hazardous, the sump contents would be removed to an appropriate disposal site. If a plastic liner is used for the sump, the liner would be removed to an appropriate disposal site upon completion of drilling and testing operations. The exact method of sump reclamation would be dependent on stipulations of the BLM and USFS and the actual chemical constituents contained in the sump.

Well Drilling Procedures: The following is a summary of the Detailed Drilling and Testing Program for deep wells that has been prepared by CEGC. For more detailed information on aspects of the proposed drilling program such as the Proposed Mud Program, Cementing Guide, BOP Testing Procedure, Testing, Logging, Plug and Abandonment and Disposal, please refer to the Detailed Drilling and Testing Program (available for review at the BLM Alturas Resource Area office and the USFS Modoc National Forest Supervisor's office in Alturas, California).

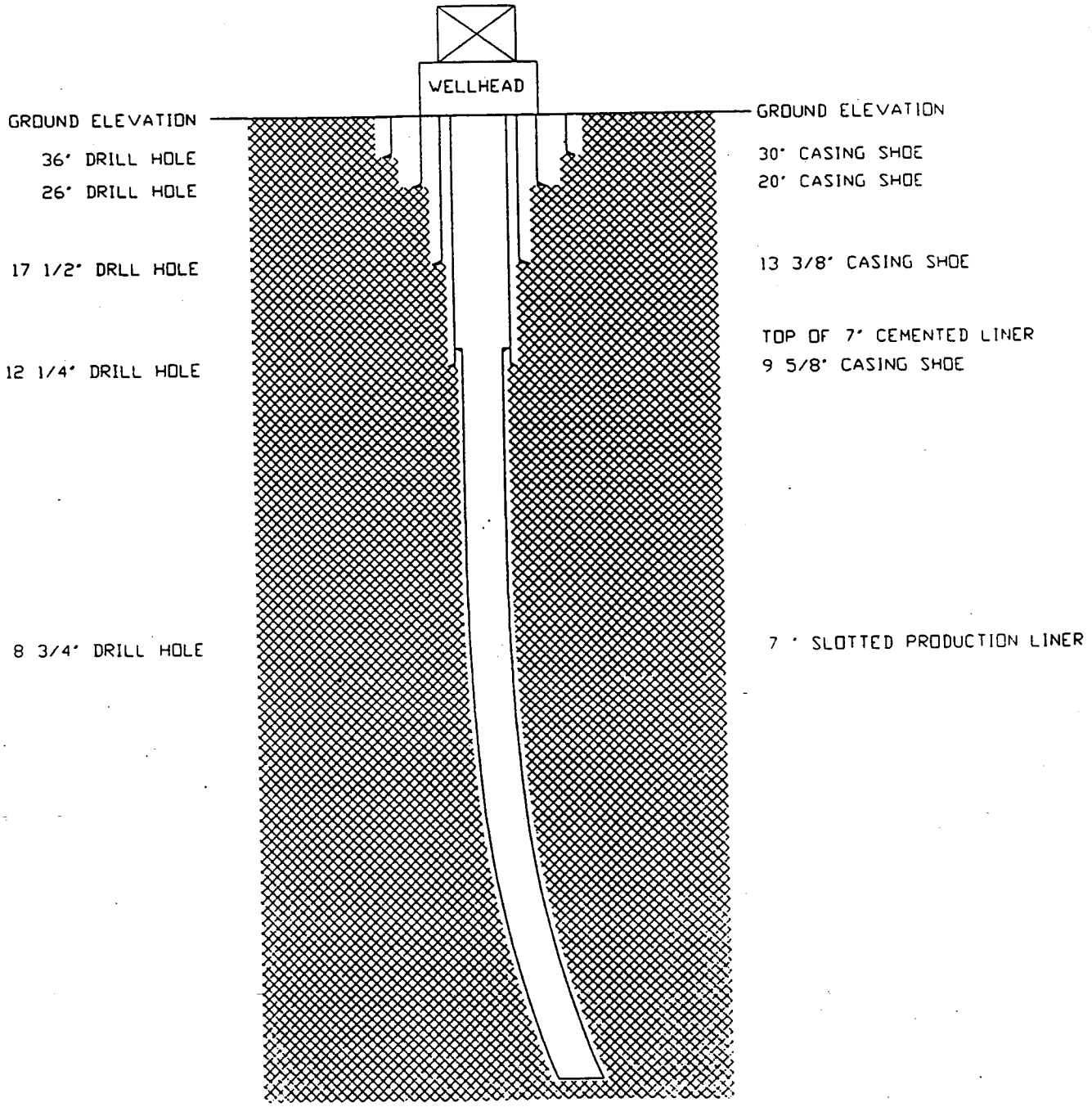
All exploration wells would be completed with directional offsets of the bottom hole locations. Figure 2.1-3 illustrates a typical directional well completion. Each of the two wells on the well pad would be completed with different bottom hole locations. The approximate target of each offset well would be identified in the drilling permit for the proposed action. Basic drilling procedures at each test well pad would be as follows:

1. Drill and set approximately 50 feet of 30-inch OD casing with a dry hole digger and cement same back to surface with Ready-mix cement
2. Drill 17.5-inch and open to 26-inch hole to 350 feet with lightweight bentonite base mud. Run and cement 20-inch surface casing to surface
3. Drill 17.5-inch hole to 2400 feet with lightweight bentonite base mud. Run and cement 13.375-inch intermediate casing to surface
4. Drill 12.25-inch hole to approximately the permitted depth with mud. Run 9.625-inch production casing and cement same to surface
5. If drilling conditions require an additional hole reduction, drill 8.75-inch hole with mud and/or air to approximately 9,000 feet. It is anticipated that the wells would be directional with 1,500 feet offset bottom hole, completed open-hole in the production zone. However, a slotted 7-inch liner may be run to near total depth if required
6. Conduct an initial rig testing, data analysis, and work over until well(s) demonstrate satisfactory commercial potential and then move rig to next location
7. Construct temporary production test facilities, place well on sustained production test for 15 to 45 days. It is probable that two or more wells could be tested at one time
8. If a well does not demonstrate satisfactory commercial potential, work over well as necessary by converting the well to an injection well if appropriate, completing the well as an observation well, or plugging and abandoning the well.

Should downhole conditions warrant, casing programs would be modified (with prior approval of the BLM) to ensure adequate safety margins and optimum production potential. If shallow water sources are encountered during drilling, the casing programs would be designed to ensure that the well is sealed from these formations. Drilling would use appropriate blow-out prevention equipment as specified in GRO No. 2 and would be initiated using non-toxic drilling mud, as defined by the U.S. Environmental Protection Agency (EPA) and California EPA (Cal EPA). When indicated by downhole conditions, compressed air would be used.

During mud drilling, the mud and rock cuttings would be separated at a "shale shaker" and desander, and the mud would be recirculated. An additional "de-watering" process may also be used to further separate sand, mud and fine particles. The processed solids would be discharged to an entirely separate "storage pit" or containers on the well pad. The reclaimed water would be recycled without entering the sump. Drilling mud waste and fluids would be restricted to the mud sump. During the mud drilling stage of operations, drill cuttings from the well bore would be run over a vibrating shaker screen and dropped into a settling tank with a sand auger. After washing with water, cuttings would be augured to a three-sided metal container.

Figure 2.1-3: Typical Directional Well Completion



SOURCE: CEGC 1994

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Periodic samples would be taken of the drilling materials and evaluated to ensure that the cuttings and mud waste are non-hazardous. During this evaluation, cuttings would be taken from the metal container by a front-end loader and stored on the well pad site. Once the separated cuttings are determined to be non-hazardous, the cuttings would be disposed of by spreading the material (which is similar to pea gravel) on the well pad and access roads. In the unlikely event that the cuttings are determined to be hazardous, the material would be dealt with as a hazardous material and disposed of at an appropriate waste disposal site.

Well Testing Procedures: The well testing procedure would initially consist of a short-term flow test from each exploration well through surface control equipment until the well flows have cleared and attained stable reservoir flow conditions. During this short-term (1 to 3 days) testing, all fluids would be diverted to the sump, while steam and non-condensable gases would be vented to the atmosphere. Steam and produced fluid samples would be collected for analyses of chemical constituents and noncondensable gases. Should the capacity of a sump be reached during short-term testing, various options would be considered for handling excess fluids (see the discussion of sumps).

If an exploration well proves to be of satisfactory commercial potential, temporary well testing facilities would be established at the well pad site for long-term (up to 90 days) production testing. All testing facilities would be constructed on previously cleared areas within the well pad. All geothermal fluids produced during long-term flow testing would be directed to the sumps before being piped to a nearby well for injection back into the geothermal reservoir. Temporary above-ground pipelines would be laid from the well test to the injection well along existing roads or other approved routes; no new surface disturbance would be required for these temporary pipelines.

After the exploration wells have flowed for a sufficient time at stable conditions to enable CEGC staff to gather necessary production and reservoir data, the well would be shut-in, and downhole pressure buildup data at the reservoir depth would be obtained to record post-production transient phenomena. The entire test would be conducted within 30 days under ideal conditions. However, depending upon production characteristics, extended test periods of over 90 days could be required. If testing stops because sump capacity has been reached (i.e., there are no injection wells available) sump contents would be pumped back into the production well after shut-in conditions have been recorded.

If an exploration well does not exhibit economic production capability, the well would be considered for use as an injection/disposal/reservoir maintenance well. Should remedial work on the well be required to convert the well to an injection well, agency concurrence would be sought by application to the BLM for Permit to Drill or Sundry Notice. A Sundry Notice would be submitted to convert a well to injection status, and sufficient geological and well casing information would be supplied to assure that produced fluids are being returned to the production zone.

Well Abandonment: If an exploration well does not exhibit economic production capability and is not suitable for conversion to an injection well, the well would be

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abandoned. Well abandonment would be accomplished in accordance with the GROs, stipulations of the BLM and USFS, and all other applicable permits or regulations (see the discussion of reclamation of page 2-17 of this EA/IS).

Water Supply

Water for construction activities and drilling and coring activities at the TCH and exploration well pad sites would either be trucked in or piped to the well pad sites from existing water wells in the Arnica Sink area (see Figure 1.1-2 for water well locations). If piping is practical, temporary above-ground pipelines would be laid from the water wells to the well pad sites along roads or other appropriate routes approved by the BLM and USFS. No new surface disturbance would be required for these temporary pipelines. For drilling at well 63-20TCH and 15-15TCH, CEGC could obtain water from existing wells such as Pumice Stone or Harris Springs (located approximately five to six miles west of Little Mount Hoffman) if required due to the distance of these proposed TCH wells from the Arnica Sink water wells and to avoid the use of water transport trucks on paved recreational travel routes near Medicine Lake.

The proposed TCH well operations would require approximately 3,000 to 5,000 gallons of water per day. Exploration wells would require approximately 9,000 gallons of water per day, and up to 40,000 gallons may be used in lost circulation zones. Under lost circulation conditions, a minimum of 20,000 gallons per day might be used. Produced fluids from successful wells may be used to reduce the need for other drilling water sources.

CEGC and subcontractors would provide bottled drinking water for all personnel at the well pad sites.

Fire Prevention

Fire extinguishers, water, and hand tools would be kept on site at all times, and employees would be instructed in their use. Spark arresters would be used on all potential spark-emitting equipment. Smoking would be allowed only on the cleared well pad. USFS fire prevention rules would be distributed to and reviewed with drill site employees and service personnel.

Personnel

Well site drilling crews, supervisory personnel, and other geothermal personnel would be expected to commute on a daily basis to the well sites from either existing housing (for local labor) or existing and available accommodations in the vicinity of the proposed action such as motels and trailer parks (for non-local labor).

CEGC plans to utilize local contractors for road and well pad construction, road maintenance, and for general labor such as setting up well test equipment and any necessary water lines. Drilling contractors would be expected to utilize their owned trained drilling crews as much as possible, but from 10 to 50 percent of the crews could be

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from the local labor force. All supervisory and technical personnel would be non-local CEGC employees that would be brought in specifically for the POO.

TCH Wells: At the TCH wells, a total of approximately three to six personnel would be at a well site 24 hours per day at any given time during the drilling and well logging operations. TCH coring rig crews would generally consist of from two to three men per eight-hour shift, with 3 eight-hour shifts per day. Coring rig personnel would only be at a particular well site during the 25- to 60-day drilling operations. Other personnel that would be at a TCH well site during both the drilling and well logging operations would include CEGC supervisory personnel, water truck operators, and maintenance and supply personnel.

Exploration Wells: At the exploration wells, a total of about nine to 14 personnel would be at a well site 24 hours per day at any given time during the 60- to 90-day drilling operations. It is expected that on-site personnel during drilling operations would include one CEGC drilling supervisor, one contractor rig supervisor, five rough necks, one mud logger, and one mud engineer (working 12-hour shifts, with two 12-hour shifts per day). There would also be one to two supply personnel on site at any given time performing specialty operations such as mud mixing, refueling, cementing, or delivering supplies. In addition, an on-call geologist would be available, and one to two CEGC employees would be working in the area on geology and project coordination; these personnel could be at a particular well pad at any given time.

During the 30- to 90-day testing of the exploration wells, technical support staff would be at a well site 24 hour per day, seven days per week. A total of one to six personnel could be at a well site at any given time. From one two maintenance personnel would be at a well site at all times during testing. In addition, one reservoir engineer, one on-call geologist, and one to two supply personnel could be at a particular site at any given time.

Schedule

All proposed exploration activities would occur during the late spring, summer, and early fall in any given year. Due to the high elevation of the proposed project area and the large amount of snowfall that occurs in the project vicinity during the winter months, access to the well pads for drilling activities would not occur during this period.

TCH Wells: The five exploratory geothermal TCH wells are scheduled to be drilled during 1995, 1996, and 1997, and should all be completed before 1999. The drilling of the TCH wells would proceed sequentially, with one TCH well being drilled at a time. It is expected that the first TCH well would be drilled during the early fall of 1995, the next two TCH wells would be drilled during the late spring to early fall of 1996, and the final two TCH wells would be drilled during the late spring to early fall of 1997.

Although the exact order of drilling has not been finalized, it is anticipated that 42-13TCH would be drilled first, followed by 11-24TCH and 34-8TCH. If these first three TCH wells adequately delineate a commercially viable geothermal resource, it may not be necessary

to drill the remaining TCH wells (15-15TCH and 63-20TCH). However, given the need to adequately delineate the geothermal resource, it is anticipated that drilling of all of the TCH wells would be necessary. Wells 15-15TCH and 63-20TCH would therefore be drilled in sequence after the first three wells are drilled.

Each TCH well would take from 25 to 60 days to drill, depending on depth and drilling conditions. After drilling is completed, the TCH wells would be maintained as temperature observation wells for as long as necessary to monitor the geothermal gradient. Operations at TCH well sites could be disrupted by fire closure orders. Upon completion of the monitoring phase, the TCH wells would be plugged and abandoned in accordance with the GROs, stipulations of the BLM and USFS, and all other applicable permits or regulations.

Exploration Wells: The development of the five exploration well pads under the POO would have a relatively flexible schedule and would take from three to four years to complete. Drilling at the first of exploration well pads would be initiated during the summer of 1995. Although CEGC currently plans to drill these wells sequentially (only one well at a time), the POO proposes the flexibility of drilling up to two wells at the same time. The first three wells could be drilled during the late spring to early fall of 1995, and the remaining two wells could be drilled in either the summer of 1996 or 1997.

In order to fully test the productivity of the proposed exploration well sites, CEGC currently plans to drill the exploration wells in the following sequence:

1) 18-32
2) 46-32
3) 58-6
4) 13-18
5) 56-18

However, CEGC requires a certain amount of flexibility in their drilling sequence in order to appropriately test the drill locations for their long-term commercial development suitability. The results of drilling at a particular well pad would affect the decision of which well pad to drill next. For example, upon completion of testing at 18-32, the results of this testing would be used in deciding whether to drill 46-32 or 58-6 next. Drilling and testing of two different wells could also occur at the same time.

Each exploration well would take from 60 to 90 days to drill and complete. After drilling is completed, testing activities at the well would begin. Each well would be tested for 30 to 90 days, depending on the production characteristics of the particular well. Operations at exploration well pads could be disrupted by fire closure orders. Upon completion of the testing phase, a decision on the final use or abandonment of a well could take several years until all testing of the geothermal resource is completed. If a well is unproductive and the reservoir is determined to be non-commercial, the well would be plugged and abandoned in accordance with the GROs, stipulations of the BLM and USFS, and all other applicable permits or regulations.

Reclamation

CEGC would be responsible for posting reclamation bonds with the BLM and USFS to ensure that all project activities would be reclaimed in a timely manner following completion of the proposed action. The bonds would be established prior to any construction activities, and would be a condition of approval for the proposed action. The bonds may be posted for either the entire Unit Area or for individual well pad sites.

Following completion of all testing at TCH wells, a proposal for abandonment of the TCH wells would be submitted to the BLM and USFS for review and concurrence. Abandoned TCH well pads and associated access roads would be restored to pre-project conditions to the greatest extent possible. TCH well pads and access roads would be recontoured approximately to their pre-project contours. Any topsoils stockpiled during construction would be replaced and the site would be reseeded and planted with native vegetation, as necessary, to minimize the potential for erosion. Revegetation of the TCH well pads would be expected to occur relatively rapidly since the TCH pads would receive minimal surface disturbance and soil compaction. More effort would be required to restore TCH access roads to natural conditions. These facilities would be recontoured, scarified to loosen the top soil, and reseeded and planted with native vegetation, as necessary.

If the geothermal reservoir is determined to have commercial potential, two options would be available for the exploration wells. If a well is unproductive, the well would be either plugged and abandoned, or considered for use as an injection well or redrilled with a second directional leg for more testing. If a well is determined to be productive, the well would be considered for development as a production well. These decisions would be made as part of the Plans of Utilization and Development that would be required for commercial development of the geothermal reservoir, and are not a part of the POO.

Although the fate of the exploration well pads at the end of the life span of the proposed action is unknown at this time, reclamation of exploration well pads and access roads would include the same elements described for restoration of TCH wells and access roads. Sumps would be filled in and the pad would be scarified prior to recontouring.

2.2 Alternative B—Elimination of Well Pads Near Medicine Lake

Alternative B would involve drilling activities at all of the well pad sites identified in the POO except TCH wells 42-13TCH and 15-15TCH, which are near Medicine Lake (see Figure 1.1-2). These core hole wells would not be drilled under this alternative due to public concern over the proximity of the well pads to Medicine Lake. In addition, the old logging skid road to well 42-13TCH would not be improved. Public concerns for TCH wells 42-13TCH and 15-15TCH include the following:

- Potential for conflict with residences at Medicine Lake through geothermal emissions, noise, and traffic
- Effects on property values of residences at Medicine Lake
- Potential for conflict with tourism and recreation at Medicine Lake

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- Effects to the Medicine Lake water table and lake level
- Potential to interfere with water supply to Medicine Lake

All drilling and testing activities and procedures at the other three TCH wells and the five exploration well pads would be the same under this alternative as described for the proposed action.

Elimination of wells 42-13TCH and 15-15TCH would limit the amount of geological knowledge that can be obtained by the project proponent about the geothermal resource. The knowledge that can be obtained from these TCH wells is considered to be critically important by CEGC in determining the future commercialization potential of the geothermal resource, and CEGC considers that the number of TCH wells identified in the POO is the minimum necessary to adequately investigate the geothermal resource. The TCH wells at well pad sites 42-13TCH and 15-15TCH would provide:

- Deep subsurface information about the regional geology, heat flow rate, rock types, alteration mineral assemblages, faults, and fracture that occur beyond the boundaries of the known resource production area
- Data regarding the Medicine Lake basin water table and regional hydrology
- Information on geologic and hydrologic systems in the Medicine Lake vicinity that could be used to understand and protect shallow aquifers and the potable water supply in the area

CEGC considers the collection of information at 42-13TCH and 15-15TCH to be necessary in developing an adequate three-dimensional model of the geothermal reservoir. CEGC has sited well pad sites 42-13TCH and 15-15TCH on previously disturbed areas in order to minimize the amount of new surface disturbance and associated environmental impacts while still accomplishing the goals of the proposed POO.

2.3 Alternative C—Elimination of Well Pads Near Mount Hoffman

Alternative C would involve drilling activities at all of the well pad sites identified in the POO with the exception of exploration well pads 18-32 and 46-32, which are located near Mount Hoffman (see Figure 1.1-2). Exploration wells at these pads would not be drilled under this alternative due to their suitability as habitat for several species, including the state and federal endangered northern spotted owl (*Strix occidentalis caurina*). These two well pad locations are within the Mount Hoffman Roadless Release Area (RRA). Under this alternative, well pads 18-32 and 46-32 would not be developed, the new access road to well pad 46-32 would not be constructed, and the existing spur road to well pad 18-32 would not be improved.

All drilling and testing activities and procedures at the other three exploration well pads and the five TCH wells under this alternative would be the same as described for the proposed action.

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Elimination of exploration well pads 18-32 and 46-32 would prevent CEGC from investigating the commercial potential of the portion of the geothermal resource that is located near Mount Hoffman. Geothermal exploration at the existing TCH well at well pad site 28-32 (see Figure 1.1-2) has already determined that the area near Mount Hoffman has high heat flow and is a highly prospective geothermal area. The siting of exploration wells at well pad sites 18-32 and 46-32 would further test the geological structures in this area for commercial resource production. The subsurface geological information that would be collected during testing at these wells is considered necessary by CEGC to adequately assess the high heat flow area in the Mount Hoffman region for resource production and to develop an adequate three-dimensional model of the geothermal reservoir. These wells would also provide data regarding geologic and hydrologic systems in the Medicine Lake vicinity.

CEGC has sited well pads 18-32 and 46-32 to obtain the necessary information regarding the geothermal resource in the vicinity of Mount Hoffman while avoiding environmentally sensitive areas to the greatest extent possible. The specific sites for well pads 18-32 and 46-32 were selected by CEGC through consultations with the USFS and wildlife biologists primarily because they contain a minimum of the necessary habitat components for sensitive wildlife species such as the northern spotted owl (which would therefore minimize potential effects from POO implementation on wildlife habitat). There are no previously disturbed pad locations in the immediate Mount Hoffman vicinity that could be drilled (either directionally or conventionally) and used to adequately test the geothermal resource in this area.

CEGC considers that the number of exploration wells identified in the POO is the minimum necessary to adequately test the geothermal resource. If well pads 18-32 and 46-32 are eliminated, CEGC feels that there would not be enough information collected to determine the commercial viability of the geothermal resource within the Glass Mountain KGRA.

2.4 Alternative D—No Action

Under Alternative D (referred to as the "No Action" alternative), the proposed POO would not be implemented. Exploratory drilling and testing of the geothermal resource described in the POO would not occur.

This alternative would prevent CEGC from collecting any additional information about the geothermal resource and from making a decision regarding the commercialization of the resource. This alternative would not be consistent with the geothermal leases that have been issued for the Glass Mountain KGRA, which explicitly provide for the exploration, development, production, and utilization of the leases.

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3: DESCRIPTION OF THE AFFECTED ENVIRONMENT

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3: DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 Introduction

This section of the EA/IS provides a description, by environmental parameter, of existing conditions in the vicinity of the proposed action. These descriptions of the affected environment are based primarily on site visits and surveys, consultations with USFS personnel, and information contained in the following documents:

- *Geothermal Leasing of National Forest Lands in the Glass Mountain Known Geothermal Resource Area Supplemented Environmental Assessment* (BLM and USFS 1984)
- *Modoc National Forest Land and Resource Management Plan* (USFS 1991a)
- *Modoc National Forest Land and Resource Management Plan Final Environmental Impact Statement* (USFS 1991b)

Other references that have been used specifically for a particular environmental parameter are identified in Chapter 6.

3.2 Geology and Soils

GEOLOGY

Regional Geology

The proposed action is located in the Medicine Lake Highlands, which are composed predominantly of volcanic formations. Landforms within the Highlands are cinder cones, caldera basins, craters, irregular rhyolite lava flows, steep volcanic side slopes, recent obsidian lava flows, and basalt capped plateau. The basement rocks of the Highlands are

the Cedarville Series and Warner Basalts, which formed much of the Modoc Plateau some 15 to 30 million years ago during the Miocene epoch. Subsequent to these flood basalt events, the Medicine Lake Highlands formed as a large, gently sloping shield volcano about 20 miles across and 2,500 feet high. This shield eventually collapsed some 500 feet, to form an elliptical caldera approximately six miles long by four miles wide. Medicine Lake is located in the remnant of the caldera.

After collapse, subsequent eruptions built new "rim" volcanoes around the caldera, resulting in a group of volcanic peaks: Mount Hoffman, Badger Peak, Red Shale Butte, and Lyons Peak. On the flanks of the volcano there are numerous parasitic cones and recent lava flows including: Big Glass Mountain, Little Mount Hoffman, Little Glass Mountain, Pumice Stone Mountain, Burnt Lave Flow, Callahan Flow, and Stud Hill.

The Medicine Lake Highlands have undergone very recent volcanic activity, including the eruption of basalt flows, obsidian flows and domes, and pyroclastic pumice. The more recent basalt flows are thought to be as young as 500 years. Erupted materials that now form the rocks and soils in the vicinity of the proposed action include: andesite, dacite, rhyolite, basalt, cinders, pumice, obsidian, and ash. Much of the caldera rim and floor has also been influenced by glaciation.

Unique Geologic Features

The relatively recent volcanic activity in the Medicine Lake area has produced several unique geologic features of particular interest in the vicinity of the proposed action. The Glass Mountain Glass Flow, Medicine Lake Glass Flow, and Burnt Lava Flow have been classified as Geological Special Interest Areas. The *Modoc National Forest Land and Resource Management Plan* calls for protection of these geologic areas to preserve their undisturbed condition while providing educational, scientific, and recreational opportunities. The lava and glass flow areas in the vicinity have been used as sources of obsidian by Native Americans (see section 3.4, Cultural Resources). The site for well 58-6 is located approximately 125 feet from the Glass Mountain Glass Flow.

GEOLOGIC HAZARDS

The proposed action is not situated in an area of high seismic activity. However, there are numerous active and inactive faults in the region. The Likely Fault and the Surprise Valley Fault, located 50 miles and 75 miles respectively from the project area, have the potential to produce a seismic event of magnitude 5.0 or greater on the Richter scale.

The Medicine Lake area has had at least three eruptive volcanic cycles in the last 1,500 years. As a result, the United States Geologic Survey (USGS) has identified the Medicine Lake Highlands as one of the four most probable sites in California where a volcanic eruption may occur. Lava flows, ash depositions, phreatic explosion, and extentional ground crack development are all potential geologic hazards that may occur in response to a renewal of volcanic activity.

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The vicinity of the proposed action is considered to have a low risk of slope movement because of gentle to moderate slopes (less than 30%), stable parent material (volcanic bedrock), and cohesive soils.

GEOTHERMAL RESOURCES

The geothermal resource at the Glass Mountain KGRA has been characterized by extensive temperature gradient drilling and geophysical surveys. In addition, four deep exploration test wells have been drilled in the Glass Mountain Unit Area. Previous exploratory drilling activities are described in Chapter 1, Introduction.

The geothermal reservoir is believed to have a small, shallow magma chamber that heats a relatively deep hydrothermal reservoir system. Table 3.2-1 presents a chemical analysis of the thermal waters produced from existing test wells at the Glass Mountain reservoir. This chemical analysis shows that geothermal fluids from the reservoir are relatively enriched in certain constituents such as chloride, silicon dioxide, sodium, potassium, and lithium.

SOILS

Soils in the vicinity of the proposed action are of volcanic origin. Parent material consists of basalt, andesite tuff, pyroclastic pumice, cinders and ash of various geologic ages. The primary soil types on the Medicine Lake Highlands are the Smarts, DeMasters, Lamondi, Stonewell, and Yallani families. These soil families are deep to moderately deep, with good drainage and low potential for slope stability hazard. These soils exhibit relatively high forest productivity with moderate to low potential for erosion (U.S. Department of Agriculture 1993).

Table 3.2-1: Chemical Analysis of Glass Mountain KGRA Thermal Waters[1]

Constituent	Concentrations (ppm)[2]
Silica (SO_2)	582.3
Sodium (Na)	632.0
Potassium (K)	107.7
Calcium (Ca)	7.9
Magnesium (Mg)	0.1
Bicarbonate (HCO_3)	49.0
Sulfate (SO_4)	46.9
Chloride (Cl)	1,021.2
Lithium (Li)	3.1

Notes:

[1]Thermal water samples were obtained from the existing well at pad 87-13; the pH of the thermal waters was measured at 8.6.

[2]ppm = parts per million; highest reported values shown.

SOURCE: CEGC 1994

3.3 Hydrology

SURFACE WATER

Medicine Lake is the main body of water in the vicinity of the proposed action and the largest body of water within twenty miles. At an elevation of 6,676 feet above sea level, Medicine Lake represents the lowest elevation within the caldera. Other surface water bodies include Little Medicine Lake (elevation 6,680 feet), Bullseye Lake (elevation 6,750 feet), and Blanche Lake (elevation 6,750 feet). There is also a large dry lake, Arnica Sink, located 1.5 miles east of Medicine lake at an elevation of 6,696 feet. In general, the surface hydrology in the vicinity of the proposed action flows away from the Medicine Lake Crater and Medicine Lake.

Medicine Lake water has been found to be of good quality with very good clarity, naturally low nutrient levels, and good buffering capacity. Water quality monitoring has not been conducted at other water bodies in the vicinity of the proposed action, but all other sources are believed to be of excellent quality (Jones 1983).

There are three springs in the area: Paynes Springs, Schonchin Spring, and Crystal Springs. Paynes Springs is the source of Paynes Creek, a perennial creek approximately two miles long (see Figure 1.1-2). Other streams in the project area are intermittent, only flowing after snowmelt and as intense storm runoff.

NEPA requires that an EA address certain Critical Elements of the Human Environment. The project area does not contain the following Critical Elements that are related to surface water: floodplains, wetlands/riparian areas, or Wild and Scenic Rivers.

GROUNDWATER

The Medicine Lake Highlands have several distinct groundwater recharge basins. Most of the recharge occurs during the spring when melting snow infiltrates the volcanic soils. In the caldera area of the Medicine Lake Highlands, the depth to the first major aquifer is generally 200 feet. On the flank of the shield volcano, the depth to the aquifer is very erratic and varies from 300 feet to over 1,000 feet. At the base of the shield volcano, the depth of the water table is approximately 500 feet.

WATER SOURCES

The USFS currently uses two sites in the vicinity of the proposed action for withdrawing water. One site is at Medicine Lake, and the other site is at the Tionesta well located east of the proposed action. At the Medicine Lake site, water is pumped from a well near the lake and used for domestic consumption, fish habitat, recreation, road construction, and fire suppression. The Tionesta well is located at the base of the shield volcano. The water from this well is used for road construction and fire suppression.

There are two existing water wells located in the Arnica Sink area about 1.2 miles northeast of Medicine Lake. These wells were drilled to support previous geothermal

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exploration activities. Well #1 was drilled by Philips Petroleum and was dedicated to the USFS which uses it for activities such as logging road maintenance. Well #2 was drilled by Unocal and is currently owned by CEGC.

HYDROLOGIC MONITORING

The U.S. Geological Survey (USGS) is currently proposing to assume hydrologic and geochemical monitoring responsibilities for hydrothermal resources in Northern California and Oregon, including the hydrothermal resource at Glass Mountain. The USGS has prepared a draft *Hydrologic Monitoring Plan for the Glass Mountain Area* (USGS 1994) that identifies the proposed monitoring program for the region. The monitoring plan focuses on monitoring water levels in water wells, measuring discharge of springs in the area, and analyzing and monitoring water quality of well, spring, and lake waters. The plan would also monitor a geothermal "hot spot" from which hot gases discharge from two distinct vents; the hot spot is located about one mile east of the proposed well pad 46-32 (see Figure 1.1-2).

3.4 Cultural Resources

The proposed action would take place in the vicinity of the Glass Mountain lava flow within an area known as the Medicine Lake Highlands (see Figure 1.1-2). A site survey and record search for cultural resources at Medicine Lake Highlands was completed in October 1994 by Far Western Anthropological Research Group, Inc. (Far Western 1994). The results of Far Western's survey and record search are summarized below.

The Medicine Lake Highlands formed as a result of numerous and complex volcanic events, with significant eruptions having occurred as recently as a few hundred years ago. The volcanic activity resulted in obsidian deposits that have been used for tool manufacture. The high elevation of the Highlands has seasonally restricted use of this area in both prehistoric and historic times to generally the summer and early fall months, and topography has favored access from the east.

PREHISTORIC

Prehistoric site types found on the Modoc National Forest range from winter village complexes to scattered hunting stations, tool manufacturing sites, and plant food processing areas. They also include petroglyphs, pictographs, bedrock mortars, rock shelters, caves, and obsidian and basalt quarries. Of particular importance are the well-known obsidian quarries at Glass Mountain.

The Medicine Lake Highlands contain toolstone-quality obsidian associated with the many obsidian flows in the area. Identified prehistoric sites are generally located near or on these flows. Most of the prehistoric sites recorded in the Medicine Lake Highlands are quarries associated with the obsidian flows. Reflective of the fact that most known prehistoric sites in the Medicine Lake Highlands are quarries, chipping debris and broken

bifaces characterize the prehistoric assemblages. Little evidence of milling equipment or hunting equipment has been discovered.

Surveys of the Medicine Lake Highlands indicate that there is a very low prehistoric site density in this area. The most comprehensive cultural resources survey that has been conducted in the vicinity of the proposed action was a survey of the Medicine Lake Highlands, Lava Beds National Monument, and Lower Klamath/Tule Lake areas (Hardesty and Fox 1974). A total of 768 cultural resource sites were recorded during this survey. Although no base camps were identified, the following five different types of "work camps" were recorded:

- Hunting blinds (two recorded)
- Fortifications (three recorded)
- Semi-permanent camps (26 recorded)
- Chipping stations (114 recorded)
- Quarries (594 recorded)

Two semi-permanent camps, two chipping stations, and all of the quarry sites were located within the Medicine Lake Highlands. These prehistoric activity sites were generally located either on or near the obsidian flows. An Elko corner-notched projectile point was also collected from the Medicine Lake Highlands (Hardesty and Fox 1974).

Other prehistoric resource surveys conducted in the Medicine Lake Highlands have mainly been performed by the USFS (Cassidy 1992; Henn 1990; Sundahl 1985). These surveys have identified primarily chipping debris and broken bifaces associated with prehistoric assemblages.

No prehistoric resources were discovered at any of the proposed well pad sites or within any of the access road corridors during Far Western's October 1994 cultural resources survey (Far Western 1994).

HISTORIC

Modern-day influences on the Medicine Lake Highlands have been minor, largely restricted to logging and pumice mining after approximately 1920, and contemporary recreational use. Historic themes that dominate many other parts of the state of California, such as transportation (e.g., emigrant trails and railroads), water development (e.g., irrigation and flumes), ore mining, and associated settlements, are of little relevance to this area. The lack of modern-day influences contributes to the area's current popularity for outdoor recreation, including camping, hiking, fishing, and hunting.

No historic resources were discovered at any of the proposed well pad sites or within any of the access road corridors during Far Western's October 1994 cultural resources survey (Far Western 1994). Two modern fire-rings (built of rocks with charcoal still evident) were identified, but these were not recorded due to their obvious modernity.

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NATIVE AMERICANS

Native American History

The general vicinity of Medicine Lake and the Modoc National Forest provides evidence of at least 11,000 years of human occupation and use of the area. Except for the past 150 years of written history, the only record of this long human history in the area is the oral history of Native Americans and the abandoned villages, camps, and other remains left by the native prehistoric peoples.

Paleo-Indians were the earliest inhabitants of the general vicinity of Medicine Lake. These peoples lived in the area approximately 10,000 to 11,000 years ago, at the end of the last Ice Age. Using fluted projectile (spear and dart) points, they hunted big game such as mammoth, bison, ground sloth, and other extinct animals. Native American peoples who lived in the Medicine Lake vicinity about 8,000 years ago left abundant evidence of their habitation. Most prehistoric archaeological sites contain surface materials (chipping debris and projectile points) spanning the last 4,000 to 6,000 years. During this period, various native cultures specialized in their adaptations to locally available resources, such as obsidian, and food and medicinal plants.

The Medicine Lake area has historically been used by a variety of Native American groups and tribes, including the Klamath, Modoc, Northern Paiute, Pit River groups, Shasta, and Wintun Tribes. Some of these groups have used the area on a temporary basis to obtain obsidian and other natural resources, while others have had more long-term occupation of the vicinity. All of these groups have rich cultural histories in the vicinity of the Modoc National Forest and the Lava Beds National Monument (to the north of the project area) involving lifeways that have been adaptive of the environment. During periods of occupation, these Native American groups seasonally inhabited settlements throughout the region, and generally returned to the same village sites and camping spots year after year. Food resources were used on a seasonal basis whenever and wherever they occurred.

The tribes that comprise the Klamath Tribes group (the Klamath and Modoc Tribes and the Yahuskin band of the Northern Paiute Tribe) and the Pit River Tribe have been the principal recent Native American occupants of the region. The Klamath Tribes group was formed as a result of the 1864 Treaty, and the Council of the Klamath Tribes is made up of representatives of each of the three tribes in the group. Although the Klamath and Modoc Tribes are related linguistically, these two tribes identify themselves as different groups. The Yahuskin band of the Northern Paiute is not linguistically related to either the Modoc or Klamath Tribe. The Klamath Tribes and the Pit River Tribe historically and currently use the vicinity of the Modoc National Forest primarily for spiritual and traditional cultural heritage activities and gatherings. Traditional uses in the area include collecting and harvesting forest resources for food, medicine, clothing, tools, and art work.

Of the recent Native American occupants of the region, the Klamath Tribes group has been the primary user of the project vicinity and Medicine Lake Highlands, and therefore is very interested in other proposed uses in the area. The Pit River Tribe is the other Native