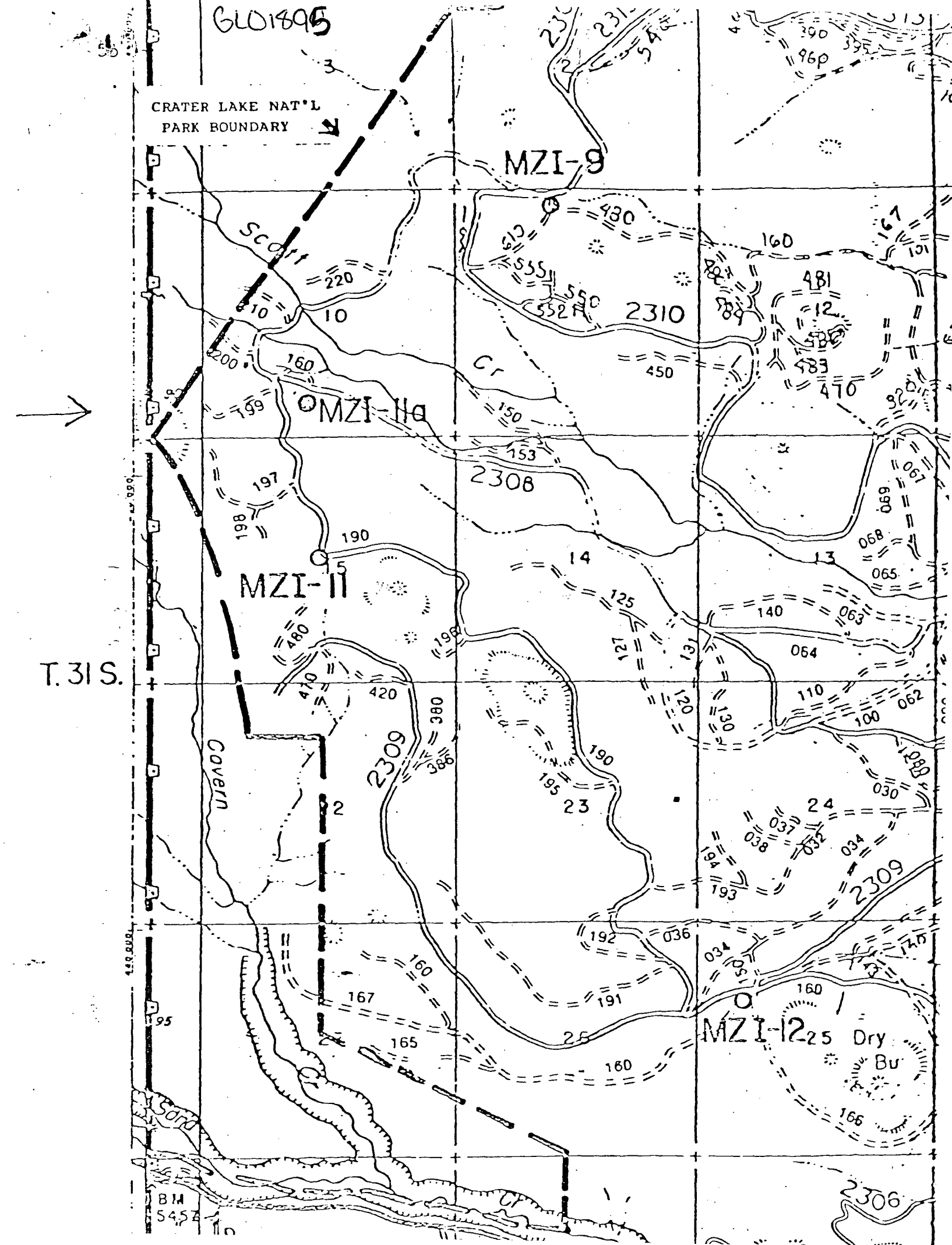
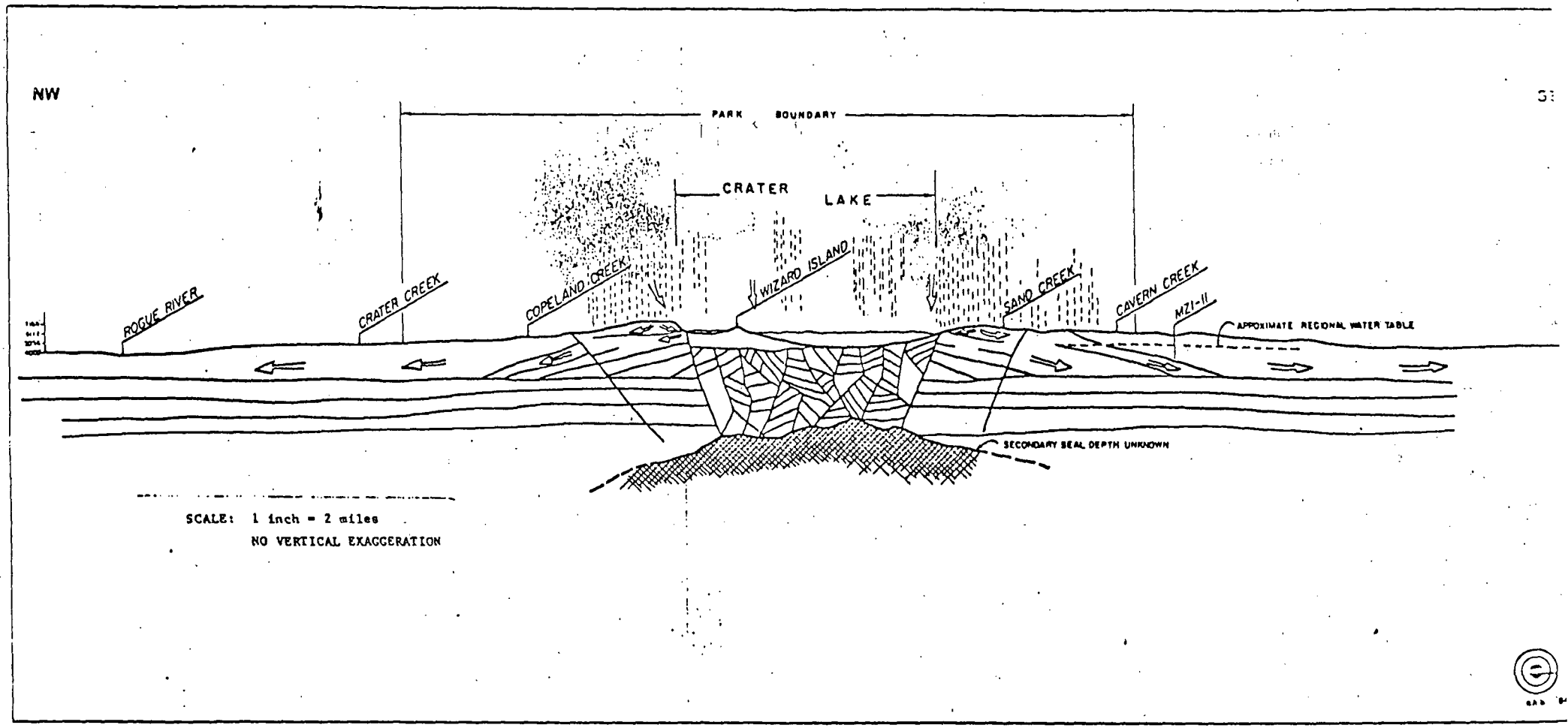
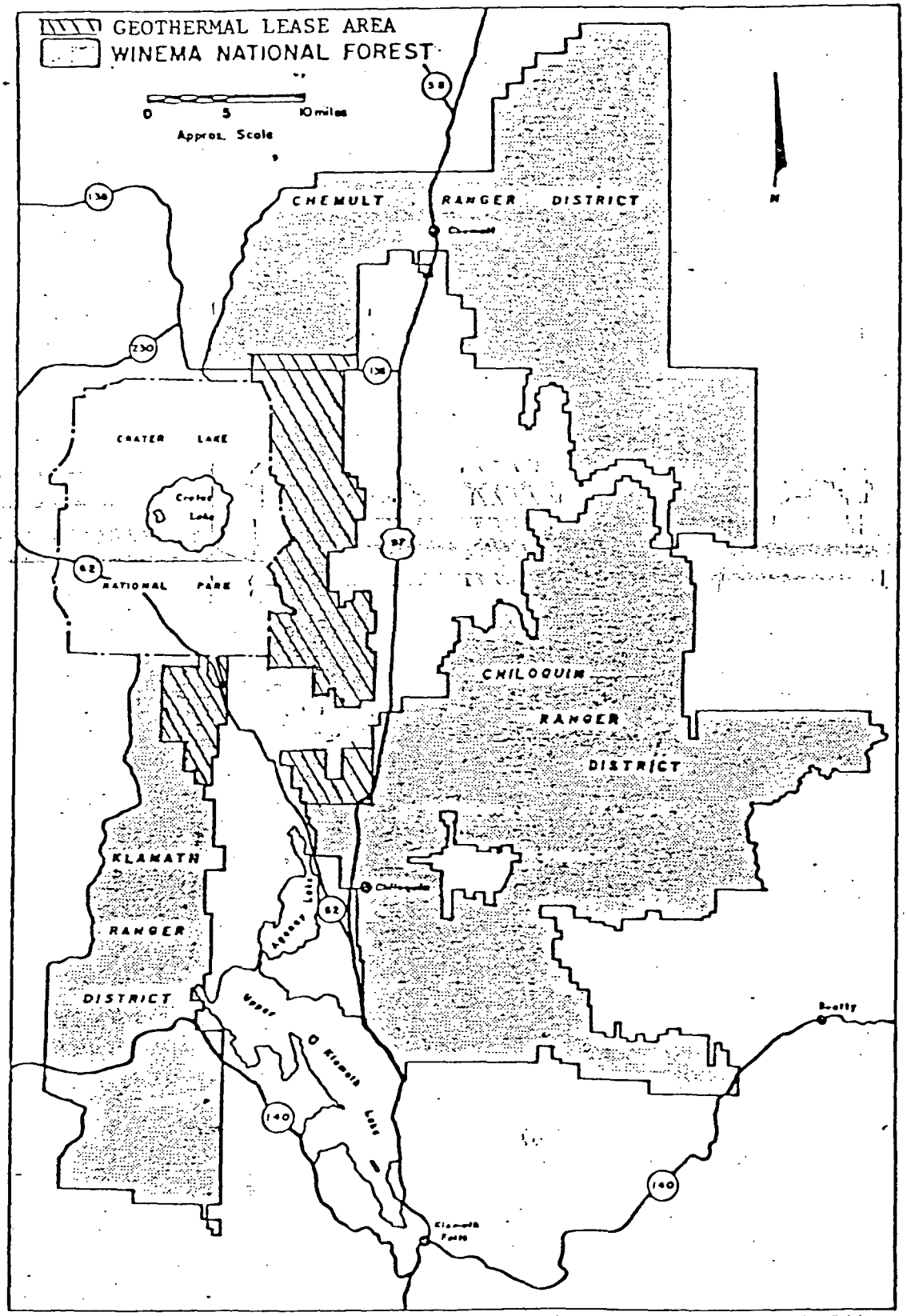

GLO1895
CRATER LAKE NAT'L PARK BOUNDARY
MZI-9
MZI-11a
MZI-11
MZI-12
T. 31 S.
2310
2308
2309
2306
Covern
Dry
Bu
BM 5457

APPENDIX D


NW
PARK BOUNDARY
CRATER LAKE
ROGUE RIVER
CRATER CREEK
COPELAND CREEK
WIZARD ISLAND
SAND CREEK
CAVERN CREEK
MZI-11
APPROXIMATE REGIONAL WATER TABLE
SECONDARY SEAL DEPTH UNKNOWN
SCALE: 1 inch = 2 miles
NO VERTICAL EXAGGERATION

VICINITY MAP
GEOTHERMAL LEASES



3-5-84
MRS

Cascades Geothermal Research

PROJECT DATA COLLECTION PLAN

Mazama Deep Temperature Gradient

Hole MZI-11A

Winema National Forest
Klamath County, Oregon

California Energy Company, Inc.
3333 Mendocino Avenue, Suite 100
Santa Rosa, CA 95401

Agreement No. DE-FC07-86ID12654

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DATA COLLECTION PLAN
MZI-11A

1.0 Geotechnical Data Collection During Drilling

The surface hole will be drilled with tri-core bit to approximately 550'. Cuttings for DOE will be collected at 10 foot intervals in four unwashed splits of at least 500 grams each. Separate samples for the Oregon Department of Geology and Mineral Industries (DOGAMI) will be collected at 30 foot intervals then washed and dried. A field-quality lithologic log will be prepared and accompany the DOE cuttings.

Surface casing will be set to a depth of approximately 550'. Below this the hole will be deepened to total depth by continuous diamond core. Continuous core will be recovered by wireline retriever. The core will be washed, boxed, photographed and temporarily stored at CECI's field office at 201N Sunriver Plaza, Sunriver, Oregon. An accompanying field quality lithologic log will be prepared for all the core. This log will include core recovery percentage, primary lithologic description, secondary mineralization/ alteration, description of fractures, fracture coatings and veining.

All of the core, except for approximately two dozen 4" to 6" pieces requested by DOGAMI and possibly a few small samples selected by CECI for thin sectioning, will be collected by and stored at the University of Utah Research Institute.

The drilling contractor will note all lost circulation zones; recording lost circulation amounts, depth and time.

The "hydraulic head" or depth to fluid in the hole will be repeatedly monitored throughout the day whenever the wireline core retriever is re-lowered into the hole. A daily record of the fluid level will be maintained and the time and hole depth of significant changes will be recorded.

If artesian flow is encountered, the drilling contractor will perform a simple flow test and record the rate of flow. The temperature of the artesian water will be recorded and representative samples will be collected for chemical analysis. At least 2 liters of clear, filtered water will be collected in plastic bottles and sealed to prevent evaporation. A two liter sample of the drilling fluid in use prior to the artesian flow will also be provided.

Mud flowline temperatures will be recorded while core drilling is in progress (approx. 550' to T.D.). During intervals of established circulation, mud temperatures will be recorded every two hours by the drilling contractor. At least once every 48 hours, non-equilibriated bottom hole temperatures will be recorded during core retrieval operations.

2.0 Geotechnical Data Collection After Drilling

Geophysical well logs will be run from the base of surface casing (approximately 550' depth) to total depth. Geophysical logging will be performed prior to casing any of this interval. The logging tools employed will provide indication of lithologic and porosity parameters. These logs will include gamma ray, electric induction/self potential, and acoustic velocity logs. The logging tools employed will be designed for high temperature, hostile environments and rated to a minimum of 450°F.

Temperature logging procedures will be conducted subsequent to the open-hole geophysical logging. 1-3/4" tubing or equivalent drill rod (BQ) will be run in the hole to T.D. This tubing will be filled with water and allowed to thermally equilibriate with formation temperatures. Temperature logs will be run inside the tubing after one week, after one month, and after one year following completion of drilling.

3.0 Environmental Monitoring and Data Collection

Visual

CECI will photograph the site prior to surface disturbance, and will compile a photographic record of the project. The site will also be photographed after completion of drilling and site reclamation. Photographs of the site will also be taken from the top of Mt. Scott and Rim Drive during drilling.

Water Quality

Up to five water quality monitoring stations will be established near the project area. Water samples will be collected and evaluated by an independent subcontractor (Century West Engineering, Bend, Oregon). Water samples will be collected prior to drilling to establish the baseline water quality. Water samples will also be collected during and after drilling to document any influence of drilling operations on water quality. The following water quality monitoring stations have been selected:

T31S, R7-1/2E:

Section 10: Scott Creek Crossing of USFS Rd. 2388 (water truck loading)
: Large spring on Scott Creek, 200 yds. north of drill site
Section 11: Confluence of north and south forks of Scott Creek
Section 13: Scott Creek upstream of Scott Creek Campground

Noise

Noise monitoring will be conducted by the BLM and CECI. BLM personnel will collect data independent from CECI. CECI will use a third party subcontractor (R & W Engineering, Portland, Oregon). Noise monitoring stations will be established by CECI at the following locations:

1) At the Drill Site
2) At the National Park Boundary approximately .43 mile NW of the drilling
3) At the top of Mt. Scott within Crater Lake National Park
4) At Lost Creek Campground, 2 miles west of the drill rig within Crater Lake National Park

Ambient noise levels will be recorded prior to drilling by CECI at each of these locations. Noise levels will be recorded during core drilling at each of these locations during a one week period when the coring operations is between 550 feet and 1500 feet. BLM will monitor for noise periodically during all phases of the operation. All noise data will be exchanged between BLM and CECI. Oregon Department of Environmental Quality and GRO #4 standards will be used by the CECI subcontractor to collect the noise data.

4.0 Coordination of Research Activities

- All inquiries for release of technical data regarding MZI-11A will be directed by CECI to UURI.

- CECI will make daily drilling reports by telecopier to DOE and UURI during drilling operations.

- CECI will provide UURI copies of field recorded data within 30 days after completion of drilling and logging and will provide DOE copies of all completion and survey reports as submitted to regulatory agencies.

- All rock cuttings and core will be temporarily stored at CECI's office at 201N Sunriver Plaza, Sunriver, Oregon. Examination of the core at this facility by DOE, UURI, DOGAMI, BLM, and USGS personnel will be allowed by CECI with prior notification and DOE approval. Inquiries by industry representative to examine the core will not be granted by CECI until after the core is transferred to UURI.

- Access to the drilling site hardhat area (to observe data collection) will be limited to CECI personnel, regulatory representatives and authorized DOE representatives.

- Access by DOE to log the well will be coordinated through CECI project manager or project geologist.

- CECI will maintain a record of samples and data provided to state and federal agencies.

- CECI and DOE will exchange any data collected within one year of completion of MZI-11A.

Cascades Geothermal Research

PROJECT MANAGEMENT PLAN

Mazama Deep Temperature Gradient

Hole MZI-11A

Winema National Forest
Klamath County, Oregon

California Energy Company, Inc.
3333 Mendocino Avenue, Suite 100
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Agreement No. DE-FC07-86ID12654

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1.0 Introduction

1.1 Abstract

This Project Management Plan is intended to define procedures pertaining to Cooperative Agreement between the United States Department of Energy (DOE) and California Energy Company, Inc. (CECI). This volume includes procedures for activities between CECI's home office and field personnel, DOE, regulatory agencies and other parties. The drilling, institutional, and data collection procedures are covered in separate volumes.

This manual is a guide for use by management administrative and field personnel. It defines certain specifics pertaining to the drilling deep Temperature Gradient Well MZI-11A.

1.2 Project Description and Objective

CECI plans to drill a deep temperature gradient hole located at SE 1/4, SW 1/4, Sec. 10, T31S, R7-1/2E, Klamath County, Oregon. The gradient well will be logged by CECI, and the data collected will be transferred to the DOE for publication.

1.3 CECI's Responsibilities

CECI will furnish the materials, facilities, equipment, personnel, services and all other necessary and related items for the drilling of, data-collection from, and plugging and abandonment of MZI-11A. CECI is also responsible for obtaining all necessary licenses and permits and providing DOE all data collected under the Cooperative Agreement.

1.4 DOE's Responsibilities

DOE will provide a specific amount of financial assistance, will monitor the project as specified elsewhere in this document, and will act upon CECI's request for approval in those instances in which DOE approval is required.

2.0 Organization

2.1 CECI Project Team

The Company is organized into functional areas which include, administration and finance, project development, exploration, land management, drilling operations reservoir production management and power plant development. Each area is supervised by a senior staff Vice President who reports to the President.

Project teams are organized according to the technical requirements of the job. Key personnel are assigned based on experience and technical abilities. A senior staff member is assigned overall project management responsibilities. The Project Manager coordinates all discipline managers and is responsible for management of the project schedule and budget. The Project Drilling Manager

will be in charge of all activities at the project site including safety, environmental control of the drill site, and coordination of subcontractors and service contractors.

Key Personnel:

Project Manager:	Jim Moore, Senior Vice President Exploration Alt: Dave McClain, Mgr., Project Development
Drilling Supervisor:	Robert Pryde, Vice President Drilling Operations Alt: Gordon Gollan, Manager, Drilling
Data Collection: Well Site Geologist	Joe LaFleur, Senior Geologist Alt: Paul Brophy, Geologist Richard Nosker, Geologist
Environmental:	Dave McClain, Manager Project Development Alt: Anna Carter, Compliance Manager
Admin. Controller:	Richard Nishkian, Vice President Finance Alt: Dave Workman
Subcontractors:	
Site Preparation:	Local Contractor
Drilling Equipment:	Longyear Drilling Company Duane Wilson
Mud Supply:	Westera Drilling Supply
Cement Supply:	Halliburton
Well Logging:	Dresser Atlas Dennis A Lynch
Water Quality Monitoring:	Century West Engineering Dave Williams
Noise Monitoring:	R & W Engineering Harry Reeder

2.2 DOE & UURI Project Team

DOE Project Team is organized to provide technical and contract/finance oversight of the project. DOE may also designate certain DOE contractors to act in DOE's behalf regarding technical oversight. University of Utah Research Institute (UURI) will provide for DOE the primary earth science technical review and EG & G, Idaho Inc. will provide the environmetnal technical review for DOE.

Key Personnel:

DOE Project Officer:	Susan Prestwich, Geologist Advanced Technology Division
DOE Contracts Officer:	Elizabeth Bowhan Contracts Sepcialist Contract Management Division
DOE Environmental Officer:	Cliff Clark Environmental Manager Environmental Division
DOE Public Information Officer:	Pete Mygatt Public Information Officer Office of External Affairs
E.G. & G. Environmental Support Staff:	Sue Steiger
UURI Team Leader:	Mike Wright, Director UURI
UURI Geologist:	Dennis Neilson Head Geological Group
UURI Geochemist:	Joe Moore Head Geochemical Group

2.3 Addresses:

California Energy Company, Inc.

CECI Corporate Headquarters
3333 Mendocino Ave., Ste. 100
Santa Rosa, CA 95401

Phone: 707-526-1000 Telex: 520-744-2088 Telecopy: 707-526-0504

CECI Sunriver Office
P.O. Box 3399
201 Sunriver Plaza
Sunriver, OR 97702

Phone: 503-593-2414 or 2415

CECI Subcontractors

Longyear Drilling Company
308 E. Pima St.
Phoenix, AZ 85004

Phone: 602-258-6543

Dresser Industries, Inc.
2421 Portola Road
Ventura, CA 93003

Phone: 805-642-7774

Century West Engineering
P.O. Box 1174
Bend, OR 97709

Phone: 503-388-3800

R & W Engineering, Inc.
6415 SW Canyon Court, Ste 100
Portland, OR 97221

Phone: 503-297-5676

DOE:

U.S. Department of Energy
Idaho Operations Office
785 DOE Place
Idaho Falls, ID 84302

Phone: 208-526-1147
Telecopier No. 208-526-6524

University of Utah Research Institute
391 Chipeta Way
Salt lake City, UT 841-81295

Phone: 801-524-4322
Telecopier: 801-524-3453

2.4 CECI Personnel Responsibilities

2.4.1 The Project Manager is responsible for the management of the project, reporting to both California Energy Company and DOE management. The Project Manager will have overall responsibility and authority for the management and control of the project for California Energy Company, and will be the prime contact with the DOE. He will have complete responsibility for planning, scheduling, administration, design, cost control and execution of all aspects of the work performance and cost. The Project Manager will direct the members of the project team and coordinate their acitivities to accomplish the work task according to the schedule. He will review all documents and reports for conformance with the project requirements and based on his experience and knowledge, review and evaluate all cost to ensure that they are complete and accurate.

The Project Manager is responsible for administration of the Project Management Plan, to organize, plan, budget, schedule, monitor and report all phases of the project. The Project Management Plan identifies interrlated, well-defined, controllable tasks with critical interfaces between task, subcontractors and regulatory agencies clearly described.

Project review will be performed at regular intervals consisting of the following activities:

- o Comparison of control budgets and actual expenditures.
- o Evaluation of planned and actual schedule accomplishment.
- o Forecasting estimates at completion.

Results of project review will be summarized in periodic reports to DOE and California Energy Company management.

2.4.2 The Drilling Supervisor will report directly to the Project Manager and will be in charge of all activities at the drill site and its immediate vicinity. The Drilling Supervisor will have complete authority regarding safety and drill rig operations. He will direct day to day drilling operations and supervise all subcontractors and equipment suppliers. He will coordinate with the senior geologist regarding data collection during drilling and supervise the safe collection of data while the rig is on location. The Drilling Supervisor will manage all site preparation, mobilization, drilling, logging and completion operations in accordance with the Project Drilling Plan.

2.4.3 The Senior Geologist will report directly to the Project Manager and will be responsible for supervising field assistance and will direct collection of all rock and fluid samples and directing all logging activities. The Senior Geologist will coordinate all activities with the Drilling Superintendent to assure safe and complete data recovery. The Senior Geologist will prepare the Project Data Collection Plan and supervise the interpretation of the data and preparation of reports.

2.4.4 The Project Environmental Coordinator will report directly to the Project Manager and will be responsible for, environmental monitoring and onsite compliance. The Environmental Coordinator will interface with the Winema National Forest, Bureau of Land Management, State and local authorities regarding compliance with all permits and environmental approvals. He will supervise environmental monitoring subcontractors preparation of environmetnal monitoring reports.

2.4.5 The Compliance Manager will report to the Project Manager and will be responsible for preparation of the Project Institutional Plan and coordination of document control. The Compliance Manager will be responsible for distribution of reports to responsible agencies and will keep the Project Manager apprised of the status of all reporting requirements. The Compliance Manager will assist in the development of all Project Plans and will develop a project reporting procedure to assure compliance with all permits and DOE reporting requirements.

2.5 DOE Personnel Responsibilities

2.5.1 The Project Manager for DOE is the person who shall be CECI's contact for all technical matters pertaining to the Cooperative Agreement. DOE's Project Manager is DOE's technical representative for the Agreement and has the following responsibilities: monitors and assesses the status of progress toward achieving the program milestones and objectives; reviews and evaluates all technical reports prepared by CECI; represents DOE at program review meetings; reviews cost vouchers; and coordinates with CECI in choosing among alternatives for future program activities. The Project Manager will be assisted by designated DOE Contractor personnel in carrying out these responsibilities.

2.5.2 The Contracting Officer has the responsibility/authority for executing, amending, and terminating award instruments. In addition, the Contracting Officer, or designee, has the responsibility for: conducting negotiations concerning the statement of work, costs, and schedule; administration of the agreement; arranging for audits, as appropriate, and resolving audit findings; assuring policies and procedures are implemented approving payments, and taking actions required to close-out the agreement.

3.0 Work Breakdown

3.1 Work Breakdown Philosphy

The work breakdown is organized to accomplish drilling a deep thermal gradient hole to a depth of 5000 feet and perform data collection both during and subsequent to drilling. The work tasks for this Project have been developed based on DOE's and CECI's objectives. The work breakdown is organized to coordinate all interdependent tasks in a scheduled and controlled manner.

The work breakdown structure (List of Tasks) and the person with primary responsibility for each of the tasks follows. Where all or a portion of a task will be subcontracted, the subcontractor is also listed.

3.2 Work Breakdown Structure

	Task	Responsibility
Area 01	Project Administration	Jim Moore/Dave McClain
Task 100	Project Management Plan	
200	Project Control/Management	
300	Clerical	
400	Control	
Area 02	Drilling Operations	Robert Pryde/ Longyear Drilling
Task 100	Project Drilling Plan	
200	Drilling Supervision	
300	Site Preparation	
400	Mobilization/Demobilization	

500	Drilling Operations	
600	Supplies	
700	Core Logging	
800	Completion	
900	Abandonment	
Area 03	Data Collection	Joe LaFleur
Task 100	Project Data Collection Plan	
200	Rock Sampling	
300	Fluid Sampling	
400	Geophysical Logging	
500	Reporting	
Area 04	Permitting and Environmental Reporting	Dave McClain
Task 100	Project Institutional Plan	
200	Permit Compliance	
300	Environmental Evaluation Report	
400	Environmental Monitoring	
500	Reporting	
Area 05	Project Reporting	Anna Carter
Task 100	BLM Drilling Reports	
200	Winema National Forest Reports	
300	Oregon DOGAMI Reports	
400	DOE Drilling and Data Reports	

3.3 Task Descriptions

Area 01 Project Administration

This task includes functions necessary for administration throughout the life of the project. These functions include project management, scheduling, monitoring, accounting, reporting, and clerical support.

Area 02 Drilling Operations

This task includes functions and actions necessary for drilling, hole completion, and maintenance.

Site access is by existing logging roads. The hole, upon completion, will consist of approximately 550 feet of 4-1/2 inch casing cemented back to surface using Halliburton. Below the shoe of the 4-1/2 inch casing the hole will be cored to total depth. Should excessive hole problems be encountered, the hole will be cased through the probelm zone (after open hole logging) and hole size reduced. It is planned to core the entire hole from the shoe of the 4-1/2 inch surface pipe to total depth. In addition to the fact that core drilling will provide excellent, continuous subsurface rock samples, it also allows drilling even if circulation is lost.

Drilling fluids will consist of EPA approved, non-toxic additives. It is anticipated that these fluids will be allowed to desicate in the sump until they can either be hauled off or worked into the native materials, dependent on chemical content and the surface manager's direction.

The well will be completed as a deep observation hole with 1-3/4 inch water filled tubing extending from surface to total depth. Access to the tubing will be secured with a locked bull plug.

Drill rig will be capable of drilling or coring to a depth of at least 5000 feet using mud, air or areated mud as a drilling fluid. The rig will be truck mounted. In addition to the drilling rig, a truck will be available to haul drilling water. Mud will be contained in steel and/or earthen pits during the drilling process and at completion of the well will be allowed to desiccate on site or hauled to an approved disposal site.

As per BLM regulations, the well will be fitted with Blow Out Equipment (BOE) as described in permit stipulations. After completion of the drilling operation, the BOE will be removed from the master gate and well containment/control will be achieved by use of that valve.

No permanent site facilities will be constructed. It is anticipated, however, that both California Energy Company and its drilling contractor will have an office trailer on location.

Drilling Procedure

The proposed program calls for drilling 7-7/8" hole with mud, aerated mud, or air (depending on subsurface conditions encountered) to 550+ feet and cementing 550' of 4-1/2" casing to surface with "Halliburton". The remainder of the hole will be cored. Coring provides better geological information requires less drilling fluid (lowering potential for "washing out" in highly fractured or unconsolidated rocks), and increased flexibility in protective casing strings.

1. Set 5'+ of 8-5/8" conductor pipe with back-hoe and cement with Ready-Mix in a 5' x 5' x 7' deep cellar.

2. Move in and rig up a combination core and rotary rig. Approximate location size 100' x 60'.

3. Spud 7-7/8" hole and drill to approximately 550'+ using a fresh water and gel drilling mud. Standby air drilling equipment will be part of the rig package to aerate the drilling mud if any serious lost circulation is encountered. Collect drill cuttings at 10 foot intervals, no electrical logs to be run over this interval.

4. 4-1/2" casing will be run and cemented at 550' to surface with Halliburton.

5. Weld on casing head flange. Nipple up to 4-1/2" casing with a master valve and hydraulic operated annular B.O.P. Pressure test all equipment to 500 psi, with advance notification to BLM to witness test.

6. Drill out cement plug to 2' below 4-1/2" casing shoe with 4-3/4" bit.

7. Start core drilling with 2.500" ID x 3.783" OD (HQ) wireline coring system. Reduce hole and core size as mandated by drilling conditions. Appropriate electric logs will be run to correlate with rock properties observed in the core. Logs will reflect temperature, porosity and lithologic parameters. It is anticipated that in addition to temperature logs, S.P., Gamma Ray, electric induction and acoustic logs will be run.

8. At completion, run 1-3/4" tubing or equivalent (BQ) drill rod to total depth; fill w/water and cap.

9. Run periodic temperature surveys up to twelve months after completion.

After completion of surveys, plug and abandon the hole in conformance with federal Geothermal Resources Operational Orders.

All surface casing design will exceed 10% of total depth.

Area 03 Data Collection

This task includes those functions and actions necessary for completion of the Data Collection Plan and distribution of the date reports. The following data collection task will be included in the Data Collection Plan.

Data Collection During Drilling

Proposed data collection during drilling operation will include the following major activities:

- Sampling of drill cuttings of every 10' during rotary drilling prior to cementing of surface casing. Preparation of detailed lithologic log. Depth 0' - 550'.

- Continuous wireline core sampling. Labelling and photographic record of core. Preparation of detailed structural, mineralogical and lithologic logs by qualified staff geologist. Sampling for thin section description as warranted by geologic conditions. Depth 550' - 5000'.

- Daily recording of core recovery as a percentage of total depth drilled. In addition, a rock quality designation (RQD) will be determined as an indication of the degree of fracturing within the hole. Depth 550' - 5000'.

- Drilling and mud service contractors to be required to report all lost circulation zones together with depth encountered and time of lost circulation. Will be monitored by well site geologist. Depth 0' - 5000'.

- o Any artesian flow during drilling will be sampled and formation water flow tested. Depth: as necessary.

- o Temperature Logging. Drilling mud flowline temperatures will be recorded while drilling is in progress. Non-equilibrated bottom hole temperature will be taken when drilling operations permit. Depth 550' - 5000'.

Data Collection After Drilling

At the cessation of drilling operations and prior to completion of the hole, the following program of data collection will be undertaken.

Geophysical Well Logs. Assuming no intermediate casing is set, logs will be run from beneath the surface casing at 550 ft. to bottomhole. If it is necessary to run intermediate casing, the same logs will be run prior to that casing operation.

Well Logging Contractor:	Dresser Atlas or Schlumberger
Well Logs:	Gamma Ray Log - Lithologic characteristic
	Electric Induction/SP log - Resistivity variation
	Acoustic Log - Formation velocity/porosity

All tools used will be designed for high temperature, hostile environments and rated to a minimum of 450°F.

Temperature Logging. At completion of drilling operations and subsequent to open hole geophysical logging, 1-3/4" tubing will be run in the hole. The tubing will be filled with water. Temperature logs will be run inside the tubing within the first week, after one month and at one year following completion of drilling.

Area 04 Permitting and Environmental Reporting

This task includes all regulatory, compliance and monitoring programs for the project. Compliance and monitoring requirements for the project and identified in the Project Institutional Plan. Environmental monitoring will include water quality, noise, and visual monitoring.

Area 05 Reporting

This task includes all compliance reports for the BLM, Winema National Forest, Oregon DOGAMI, and DOE.

4.0 Schedule

The Project Schedule has been outlined to assure successful completion of the drilling of the deep temperature gradient well and provides for close coordination and integration of all project tasks. California Energy will use a 12 month schedule to complete all drilling well completion and data logging and reporting operations. A major schedule constraint to operations at this

location is the winter snow season. All site operations must be completed by November 30 to avoid extreme weather conditions. Operations will also be constrained by winter snow pack which can restrict site access from November through April.

The schedule in Figure 1 identifies the time requirements to accomplish the task identified in the work breakdown structure.

5.0 Project Status Evaluation

5.1 Cost Control

5.1.1 Direct Labor System

CECI uses a direct labor system for payroll and billing. It records project task numbers weekly for each employee. Billing and payroll are generated and controlled by the system. All CECI time sheets for this project will note Job Code 42 denoting tthe Mazama Prospect Area unit account and task descriptions will identify the specific well number and the work breakdown area and task numbers as shown in Figure 2 Example Time Sheet.

5.1.2 Cost Accounting

DOE will receive a semi-monthly invoice itemizing all charges against the project. The cost accounting system to support this invoice and provide backup invoice data is in two sections: payroll-related costs and non-payroll costs.

The basis for all payroll-related costs is the employee's time card. Individuals record their time worked on each task in the Work Breakdown Structure to the nearest hour on weekly time cads, which are approved by that individual's supervisor. This information is entered into the direct labor system,. The project manager is responsible for approval of the hours charged to the project. Once the information is verified and approved, it is combined with the employee's actual payrates to produce project labor costs and billings. These hours and costs are also used to update the actual expended portion of the project control system. This system is such that any labor charge can be easily tracked back to the original signed time card.

Non-payroll costs are billed semi-monthly. The project manager is responsible for verifying and approving all non-payroll charges against the project.

5.1.3 Approval of on Site Materials Purchased

The Project Manager is responsible for approval of purchase of all materials. He may delegate this responsibility to the Drilling Manager on site or to the drilling subcontractor. The Project Manager will be responsible for verifying these changes and approving that the invoice is chargeable against the project.

5.1.4 CECI Vehicle Cost

Actual mileage logs will be recorded for CECI vehicles used in connection with this project. The mileage log will record the total miles driven semi-monthly, vehicle license number, and employees name.

5.1.5 Subcontractor

The Project Manager will be responsible for approval of all subcontracts and will review and approve all subcontractor invoices.

5.2 Performance Evaluation

CECI will send the DOE a detailed progress report monthly which will include the project progress, schedule and will relate the expenditures to budget. Cost to date will also be estimated on the daily drilling reports telecopied to UURI and DOE.

6.0 Administrative Procedures

6.1 Project Files

Project files are established to facilitate document retrieval. The project file will be set up by the Project Manager and be indexed to the work breakdown structure.

6.2 Communications

6.2.1 Incoming Correspondence

Project Manager: Reviews correspondence, assigns routing instructions, then returns all original correspondence to Secretary for disposition.

6.2.2 Outgoing Correspondence

All outgoing project correspondence shall be reviewed and signed by the Project Manager. In the Project Manager's absence, to avoid unnecessary delay, another responsible member of the project team may review and sign the correspondence. However, in such cases, signators shall sign their own name and write the word "for" above the typed name for the Project Manager.

Correspondence initiated by California Energy includes the following reference:

Cascades Geothermal Research
DOE Cooperative Agreement No. DE-FC07-86ID12654
MZI-11A

Outgoing correspondence is distributed according to the Project Manager.

6.2.3 Notes of Conference

Notes of conference will be taken for all meetings. Index and subject file numbers are assigned according to the project file index.

6.2.4 Telephone

Telephone conversations of major importance to the project (change in scope, contractual matters, etc.) shall be formally confirmed by a letter.

6.2.5 Telecommunications

Telecommunications consist of telexed, telecopied, computer telecommunicated correspondence. Subject file numbers are assigned according to the project file index. Daily drilling reports will be telecopied using the report form found in Figure 3.

6.2.6 Document Transmittal

Copies of outgoing document transmittals are maintained by the Secretary. If acknowledgment of receipt is required by the project, the signed acknowledgement copy is filed with the outgoing copy of the transmittal.

6.3 Business Management

6.3.1 Estimated Cost

The total estimated cost of the work under this Agreement is $605,000. For performance of work under this Agreement, the agreed share ratio of allowable direct labor and indirect costs is 38% DOE and 62% CECI and the agreed share ratio of allowable travel, purchases, and subcontracts is 50% DOE and 50% CECI. CECI shall be reimbursed by DOE for not more than 38% of the direct labor and indirect costs and 50% of the travel, purchases, and subcontract costs of the project determined to be allowable in accordance with General Provision No. 29, entitled "Allowable Cost and Payment." The remaining cost of the project so determined shall constitute CECI's share for which it will not be reimbursed by DOE. If at any time CECI has reason to believe that this or any revised estimate is in error, CECI shall so notify DOE in writing and provide DOE with a new estimate within thirty days.

6.3.2 DOE's Financial Support

The total cost to DOE for all the work under this project is Two Hundred Eighty-Five Thousand Dollars ($285,000), and under no circumstances will DOE's support exceed this amount. This limitation includes termination costs, if any.

6.3.3 CECI's Financial Support

All costs in excess of the Two Hundred Eighty-Five Thousand Dollars ($285,000) to be provided by DOE will be provided by CECI.

6.3.4 Obligated Funds

The amount of funds presently obligated to this Agreement by DOE is Two Hundred Eighty-Five Thousand Dollars ($285,000).

6.3.5 Payments

Progress payments will be made on the basis of allowable costs incurred subject to the applicable cumulative ceiling. Invoices shall be submitted to DOE upon completion of each of the following milestones:

	Milestone	Maximum Cumulative Amount Payable by DOE
1.	Rig Mobilization	$ 25,850
2.	Drill to a Depth of 1400'	$ 86,950
3.	Drill to a Depth of 2800'	$143,350
4.	Drill to a Depth of 4000' and Demobilize	$199,710
5.	Well Data to DOE	$210,203
6.	Complete Site Maintenance and Restoration	$215,000

Payments approximate costs associated with respective phases but do not exactly correspond. The schedule is for progress payments only; actual allowable costs will be determined in accordance with Article III and General Provision No. 29.

6.3.6 Payment Methods

A. Four copies of invoices shall be submitted to the address specified on Block 12 of the NFAA (DOE Form 4600.1).

B. Payments due for amounts properly invoiced in accordance with the terms and conditions specified elsewhere in the Cooperative Agreement shall be made either by Treasury check(s) payable to CECI or by electronic funds transfer(s) to a financial institution designated by CECI. The method of payment shall be determined by the Government at the time of payment in accordance with applicable Department of Treasury requirements.

C. After award but no later than fourteen (14) days before an invoice or bill is submitted for payment, CECI shall designate a financial institution for the receipt of electronic funds transfer payments hereunder; and provide the appropriate Government representative (Contracting Officer or finance official as determined by the Government) with the name of the designated financial institution, financial institution's or correspondent financial institution's 9-digit American Bankers Association identifying number, telegraphic abbreviation of such financial institution, and account number at the designated financial institution to be credited with the funds.

D. In the event CECI during the performance of the Cooperative Agreement elects to designate a different financial institution for the receipt of any payment made using electronic funds transfer procedures, notification of such change and the information as specified in paragraph B. above must be recieved by the appropriate Government representative thirty (30) days prior to the date such change is to become effective.

6.4 Procurement Procedure

California Energy Company, Inc. ("CECI" or "Cal Energy") maintains a Code or standard of conduct that shall govern the performance of its officers, employees or agents engaged in the awarding and administration of contracts using Federal funds.

1. No employee, officer or agent shall participate in the selection, award or administration of a contract in which Federal funds are used, where, to his knowledge, he or his immediate family, partners or organization in which he or his immediate family or partner has a financial interest, or with whom he is negotiating or has an arrangement concerning prospective employment.

2. Cal Energy's officers, employees or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from contractors or potential contractors.

3. All procurement transactions shall be conducted in a manner to provide to the maximum extent practical, open and free competition.

4. Proposed procurement actions shall follow a procedure to assure the avoidance of purchasing unnecessary or duplicative items.

5. Where appropriate, an analysis shall be made of lease and purchase alternatives to determine which would be the most economical, practical procurement.

6. Solicitations for goods and services shall be based upon clear and accurate description of the technical requirements for the material, product or service to be procured. Such a description shall not, in competitive procurements, contain features which unduly restrict competition.

7. Positive efforts shall be made by CECI to utilize small business and minority-owned business sources of supplies and services.

8. The type of procuring instruments used (e.g., fixed price contracts, cost reimbursable contracts, purchase orders, incentive contracts) shall be determined by CECI but must be appropriate for the particular procurement and for promoting the best interest of the program involved. The "cost-plus-a-percentage of cost" method of contracting shall not be used.

9. Contracts shall be made only with responsible contractors who posses the potential ability to perform successfully under the terms and conditions of a proposed procurement. Consideration shall be given to such matters as

contractor integrity, record of past performance, financial and technical resources or accessibility to other necessary resources.

10. All proposed sole source contracts or where only one bid or proposal is received in which the aggregate expenditure is expected to exceed $5,000 shall be subject to prior approval at the discretion of the Federal sponsoring agency.

11. Some form of price or cost analysis should be made in connection with every procurement action.

12. Procurement records and files for purchases in excess of $10,000 shall include the following:

    a. Basis for contractor selection;
    b. Justification for lack of competition when competitive bids or offers are not obtained; and
    c. Basis for award cost or price.

13. A system for contract administration shall be maintained to ensure contractor conformance with terms, conditions and specifications of the contract.

14. Contracts in excess of $10,000 shall contain contractual provisions or conditions that will allow for administrative, contractual or legal remedies in instances in which contractors violate or breach contract terms, and provide for remedial actions as may be appropriate.

15. All contracts in excess of $10,000 shall contain suitable provisions for termination by Cal Energy.

16. All contracts for construction for more than $100,000 shall have required bonding.

6.5 DOE Project Monitoring

DOE will closely monitor the performance of work under the cooperative agreement. This monitoring shall include: frequent telephone communications; site visits with frequency and duration as dictated by program needs; onsite monitoring; participation in program review meetings; review of specified program reports; determination that milestones are satisfactorily accomplished; and generally handling routine contract administration activities as necessary to maintain the program budget and schedule within established limits.

In addition, DOE may assign an on-site or resident technical monitor for a portion of the program performance. The principal responsibility of the resident technical monitor will be to maintain frequent communications regarding project technical progress stataus with DOE program and project management personnel.

7.0 Coordination of Information and Communication

7.1 Project Information System

CECI shall prepare and submit to DOE and it designates (postage prepaid) the plans and reports indicated on the Reporting Checklist. Preparation of the specified plans and reports shall be in accordance with DOE Order 1332.2, Uniform Reporting System for Federal Assistance (grants and cooperative agreements). CECI shall be responsible for acquiring data from any subcontractors, to ensure that data submitted are compatible.

CECI shall not claim that any report contains any trade secrets or commercial or financial information deemed by the Participant to be privileged or confidential, or that the Participant has any proprietary interest in any report.

CECI and DOE will coordinate public disclosure or dissemination of new data or information arising out of the design, construction or operation of the project, it being understood that the intent is to release all data and information to the greatest practicable extent in order to achieve the objective of obtaining maximum public value from the results of this project. It is understood that the foregoing is not intended to afford either party the right to prevent a public release by the other. CECI will distribute reports to the following distribution list:

U.S. Department of Energy
Idaho Operations Office
785 DOE Place
Idaho Falls, ID 83402

Susan M. Prestwich, Geologist
Advanced Technology Division

Elizabeth M. Bowhan
Contracts Specialist
Contracts Management Division

Earl G. Jones
Director
Financial Management Division

U. S. Department of Energy
Technical Information Center
Oak Ridge, TN 37830

University of Utah Research Institute
391 Chipeta Way
Salt Lake City, UT 84108

Mike Wright, Director
Earth Science Laboratory

7.2 Media Information Procedure

All activity concerning the media will be coordinated through California Energy Company and the Winema National Forest.

Interviews will be granted only when prearranged. This may be done by phone at any time by contacting Jim Moore or Joe LaFleur at:

Santa Rosa Office: 707-526-1000

7.3 Public Tours

None of the proposed sites are in areas of heavy public use. During operation the sites will be occupied on a 24 hour per day by Company and contractor personnel. Persons not directly involved in the operations will be restricted from the site.

Tours given by California Energy, DOE or the Winema National Forest for the benefit of the media or the general public will be prearranged at least 24 hours ahead of time.

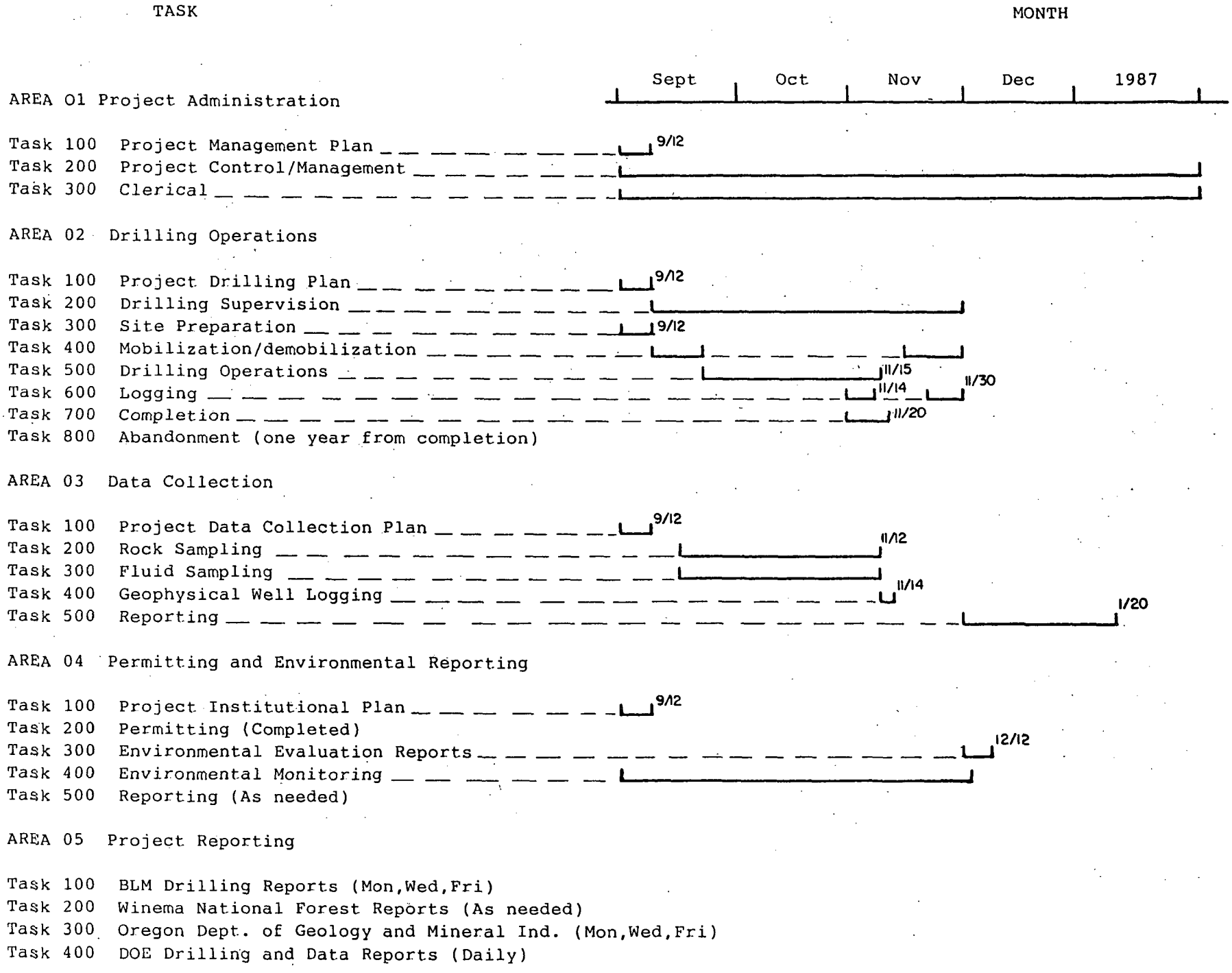
All planned visiting guests will be met and escorted by California Energy personnel. Guests will meet at the Chiloquin Junction, Highway 97 and Road 2308. From there they will follow CECI into the forest and onto the drillsite.

The entire drillsite is a designated hard hat area. Visitors are to first proceed to the drilling managers trailer office to receive and don hard hats.

7.4 Third Party Communications

The Bureau of Land Management (BLM) and Winema National Forest (WNF) have established responsibilities and authorities for communication (refer to the Introduction to the Mazama Core Hole Manual in the Project Institutional Plan).

FIGURE 1


TASK
MONTH
Sept
Oct
Nov
Dec
1987
AREA 01 Project Administration
Task 100 Project Management Plan
9/12
Task 200 Project Control/Management
Task 300 Clerical
AREA 02 Drilling Operations
Task 100 Project Drilling Plan
9/12
Task 200 Drilling Supervision
Task 300 Site Preparation
9/12
Task 400 Mobilization/demobilization
Task 500 Drilling Operations
11/15
Task 600 Logging
11/14
11/30
Task 700 Completion
11/20
Task 800 Abandonment (one year from completion)
AREA 03 Data Collection
Task 100 Project Data Collection Plan
9/12
Task 200 Rock Sampling
11/12
Task 300 Fluid Sampling
Task 400 Geophysical Well Logging
11/14
Task 500 Reporting
1/20
AREA 04 Permitting and Environmental Reporting
Task 100 Project Institutional Plan
9/12
Task 200 Permitting (Completed)
Task 300 Environmental Evaluation Reports
12/12
Task 400 Environmental Monitoring
Task 500 Reporting (As needed)
AREA 05 Project Reporting
Task 100 BLM Drilling Reports (Mon,Wed,Fri)
Task 200 Winema National Forest Reports (As needed)
Task 300 Oregon Dept. of Geology and Mineral Ind. (Mon,Wed,Fri)
Task 400 DOE Drilling and Data Reports (Daily)

Cascades Geothermal Research

PROJECT INSTITUTIONAL PLAN

Mazama Deep Temperature Gradient

Hole MZI-11A

Winema National Forest
Klamath County, Oregon

California Energy Company, Inc.
3333 Mendocino Avenue, Suite 100
Santa Rosa, Ca. 95401

Agreement No. DE-FC07-86ID12654

INSTITUTIONAL PLAN

California Energy Company/DOE
Cost Share Agreement DE-FC07-86ID12654

Deep Temperature Gradient Core Hole MZI-11A

BACKGROUND

The MZI-11A site is on Winema National Forest (WNF) lands in Klamath County, Oregon, on Lease No. OR 34669. The U.S. Bureau of Land Management (BLM) issued California Energy unitized (Mazama I and II Units) and nonunitized geothermal leases in the WNF under the USFS Contingent Right Stipulations procedure on January 1, 1984.

BLM is the lead agency responsible for administration of the leases and operations on the leases. Permitting and operating procedures for exploration and development on leases are set forth in regulations promulgated under the Geothermal Steam Act of 1970 and in the federal Geothermal Resources Operational Orders (GROs) administered by BLM. Proposed operations are permitted through submittal of plans of operation and applications for permits (as set forth in GRO No. 5) to the BLM Portland Office. BLM Inspections and Enforcement personnel administer compliance with the GROs for subsurface (drilling) operations through their Lakeview or Prineville District Offices.

WNF, the surface manager, works closely with BLM in the environmental documentation process, coordinates operations and maintains communications with interested parties, Crater Lake National Park and Klamath County. WNF is the lead agency for administering USFS regulations and issuing and administering surface use permits (road use, water access, fire prevention, etc.). For this project, WNF is also taking a more active role in administering compliance with BLM GRO No. 4 - General Environmental Protection Requirements.

On January 29, 1984, a Plan of Exploration was submitted to BLM identifying 24 sites for drilling of temperature gradient (TG) core holes up to 4,000' in depth. BLM and WNF proceeded to prepare an Environmental Assessment (EA) for the proposed drilling. Applications for Permits to Drill nine holes were submitted to BLM on March 29, 1984 under an assumption that the environmental process would be completed in time to allow drilling during the 1984 field season. BLM and WNF issued a Draft EA and Preliminary Finding of No Significant Impact (FONSI) on May 14, 1984.

Concerns about possible impacts on Crater Lake National Park, expressed late in the EA process, received careful consideration at all levels and delayed issuance of the Final Amended EA, FONSI and Decision Record until December 12, 1984. In consideration of the environmental/regulatory delay, and in accordance with the provisions of the leases and the USFS Contingent Right Stipulation procedures under which these leases were approved for issuance, BLM granted California Energy a temporary suspension of the obligations of the Mazama I and II Units from April 1, 1984 to May 1, 1985.

PERMITTING AND COMMUNICATIONS

All permits and environmental approvals necessary to complete the MZI-11A hole have been obtained. Copies of any changes to permits and approvals, and all completion reports will be submitted to DOE as they are generated.

California Energy has maintained close communications with regulatory agencies, conducted tours of the sites, and has been responsive to requirements and requests throughout the history of the permitting of this project.

In order to ensure compliance in the field with the stipulations of permits, and to maintain appropriate communications, California Energy has developed a "Mazama Core Hole Manual." The manual contains an introduction to regulatory agency permits, a list and copies of permits and supporting documents and a list of Authorities and Communications. The Mazama Core Hole Manual is distributed to California Energy management, geological and drilling personnel, with courtesy copies to BLM and WNF.

The "Mazama Core Hole Manual" is made a part of this Institutional Plan by reference and is attached hereto as Exhibit I.

Cascades Geothermal Research

PROJECT DRILLING PLAN

Mazama Deep Temperature Gradient

Hole MZI-11A

Winema National Forest
Klamath County, Oregon

California Energy Company, Inc.
3333 Mendocino Avenue, Suite 100
Santa Rosa, CA 95401

Agreement No. DE-FC07-86ID12654

TABLE OF CONTENTS

PROJECT DRILLING PLAN
MZI-11A

1.0 Introduction

1.1 Abstract

This Project Drilling Plan is intended to summarize drilling procedures pertaining to drilling MZI-11A under a Cooperative Agreement between the United States Department of Energy (DOE) and California Energy Company, Inc. (CECI). This volume includes drilling procedures for CECI's field personnel based on the Bureau of Land Management (BLM) and Oregon Department of Geology and Mineral Industries (DOGAMI) drilling permits.

1.2 Project Description and Objective

CECI plans to drill a deep temperature gradient hole located at SE 1/4, SW 1/4, Sec. 10, T31S, R7-1/2E, Klamath County, Oregon. The gradient well will be logged by CECI, and the data collected will be transferred to the DOE for publication.

2.0 Drill Site

2.1 MZI-11A Site Location

The MZI-11A site is located in the SE 1/4, SW 1/4, Sec. 10, T31S, R7-1/2E in the Winema National Forest (see location map Figure 1). The drill site is an old log landing acessible by existing roads, at an elevation of approximately 6050 feet. The permitted source of water for drilling and miscellaneous use is the main fork of Scott Creek about 1/2 mile north of the drill site (see Figure 2).

2.2 Geologic Setting

Mount Mazama is located at the north end of the Klamath Graben, where this large NNW trending Basin and Range rift bends northward into coincidence with the High Cascades trend. The zone of crustal weakness created by this intersection was apparently facilitated by the repeated influx of mafic magma from great depth and the evolution of upper level silicic magma chambers.

The Mazama Quaternary stratovolcano lies on a pile of interspersed shields, stratocones, small monogenetic volcanoes and valley fillings of basalts and andesites that compose the volcanic rocks of the High Cascades. This base of older High Cascades volcanics may date back to 7 million years B.P. At greater depth, the volcanic rocks of the Western Cascades group probably underlie the Mazama massif. This group is composed of subequal amounts of basalts, andesites and rhyolitic tuffs and flows that range in age from 15 to 35 million years. About 20 km west of Crater Lake the Western Cascades group is roughly 18,000 feet thick and dips gently westward; however, the depth and thickness of this sequence beneath Mt. Mazama is speculative. The nature of the older basement rocks underlying the Mazama area is unknown, but Paleozoic metasediments are suspected.

The east flank of the Mazama massif consists of an older silicic volcanic field composed of dacitic domes and associated lava flows. Many of these dacitic domes are aligned in northwest trending vent linears. Two such vent trends comprise the NW trending ridges that flank the Scott Creek drainage. They may reflect older fault zones that facilitated magma ascension. Whether the NW linear trend of Scott Creek is fault controlled is undetermined but possible.

Mount Scott, a large and prominent volcanic vent, is centered about 2-1/4 miles NW and up-hill of the MZI-11A site. Lava flows from Mount Scott extend down to the area of the MZI-11A site and presumably overlie older dacite flows of the east-side dome field.

2.3 Site Preparation

The drill site is a level area which was recently used as a logging landing. The site is covered with scattered logging slash material and a small amount of natural revegetation material.

Site preparation will include removal of brush leveling the pad with a backhoe bucket blade and digging and lining with plastic the mud sumps. Brush will be stockpiled along the side of the pad to be used for reclaimation cover after abandonment. An open area approximately 200 x 200 feet is available for pad construction without any additional clearing. Additional parking areas for trucks and equipment is available along the main access road. Two sumps will be constructed by a backhoe and be approximately 6 x 10 x 20 feet each and lined with visquine.

3.0 Drilling

3.1 Drilling Operations

Drill rig will be capable of drilling or coring to a depth of at least 5000 feet using mud, air or aereated mud as a drilling fluid. The rig will be truck mounted. In addition to the drilling rig, a truck will be available to haul drilling water. Mud will be contained in steel and/or earthen pits during the drilling process and at completion of the well will be allowed to dessicate on site.

The proposed program calls for drilling 7-7/8" hole with mud, aereated mud, or air (depending on subsurface conditions encountered) to 550+ feet and cementing 550' of 4-1/2" casing to surface with "Halliburton." The remainder of the hole will be cored. Coring provides better geological information, requires less drilling fluid (lowering potential for "washing out" in highly fractured or unconsolidated rocks), and increased flexibility in protective casing strings.

As per BLM regulations, the well will be fitted with Blow Out Equipment (BOE) as described in permit stipulations. After completion of the drilling operation, the BOE will be removed from the master gate and well containment/control will be achieved by use of that valve.

No permanent site facilities will be constructed. It is anticipated, however, that both California Energy Company and its drilling contractor will have an office trailer on location.

The planned hole design consists of the following:

1. Set 5'+ of 8-5/8" conductor pipe with backhoe or rotary rig and cement with Ready-Mix.

2. Move in and rig up a combination core and rotary rig. Approximate location size 100' x 60'. Cellar as necessary.

3. Spud 7-7/8" hole and drill to approximately 550'+ using a fresh water and gel drilling mud. Standby air drilling equipment will be part of the rig package to aereate the drilling mud if any serious lost circulation is encountered. Collect drill cuttings at 10 foot intervals, no electrical logs to be run over this interval.

4. 4-1/2" casing will be run and cemented at approximately 550'. to surface with Halliburton.

5. Weld on casing head flange. Nipple up to 4-1/2" casing with a master valve and hydraulic operated annular B.O.P. Pressure test all equipment to 500 psi, with advance notification to BLM to witness test.

6. Drill out cement plug to 2' below 4-1/2" casing shoe with 4-3/4" bit.

7. Start core drilling with a 2.500" ID x 3.783" OD (HQ) wireline coring system. Reduce hole and core size as mandated by drilling conditions. Appropriate electric logs will be run to correlate with rock properties observed in the core. Logs will reflect temperature, porosity and lithologic parameters. It is anticipated that in addition to temperature logs, S.P., Gamma Ray, electric induction and acoustic logs will be run.

8. At completion, run 1-3/4" tubing or equivalent (BQ) drill rod to total depth; fill w/water and cap. It may be necessary to run open ended, depending on hole conditions.

9. Run periodic temperature surveys up to twelve months after completion.

After completion of surveys, plug and abandon the hole in conformance with federal Geothermal Resources Operational Orders.

3.2 Drilling Fluids and Disposal Method

Drilling fluids will consist of EPA approved, non-toxic additives. It is anticipated that these fluids will be allowed to dessicate in the sump until they can either be hauled off or worked into the native materials, dependent on chemical content and the surface manager's direction.

3.3 Hole Completion

The hole, upon completion, will consist of approximately 550 feet of 4-1/2 inch casing cemented back to surface using Halliburton. Below the shoe of the 4-1/2" casing the hole will be cored to total depth.

The well will be completed as a deep observation hole with 1-3/4" water filled tubing extending from surface to total depth. Access to the tubing will be secured with a locked bull plug.

3.4 Anticipated Hole Problems

Potential downhole problems include loss of tools, deviation in hole direction and loss of circulation. Loss of tools can occur for several reasons, the most likely will be twisting off. If a mechanical failure occurs an attempt will be made to fish out the tools and resume drilling. If deviation in hole direction occurs corrective measures may include using a stiffer drill string, and/or pulling back, plugging and redrilling through the problem area. Should excessive hole problems be encountered, the hole will be cased through the problem zone (after open hole logging) and hole size reduced. It is planned to core the entire hole from the shoe of the 4-1/2" surface pipe to total depth. In addition to the fact that core drilling will provide excellent, continuous subsurface rock samples, it also allows drilling even if circulation is lost.

Loss of circulation is most critical in setting the 550 feet of surface casing. Recirculation of the cement to the surface is a requirement of the BLM permit. If lost circulation occurs in the first 550 feet of hole cement plugs will be used to block off the problem zone. If localized plugs are not effective, then the hole can either be filled with Ready-Mix, and drilled out or a shorter string of surface casing set above the problem zone. The BLM permit requires surface casing be at least 10% of the total depth. Exemptions to this rule can be obtained but depend upon the type of cement job and length of the casing eventually set. The Project Manager will keep DOE informed if lost circulation can not be controlled and a shorter surface casing must be set. Lost circulation during surface casing program at CECI's North Newberry core hole caused a two week delay and $60,000 cost overrun. This example is considered a typical situation.

4.0 Schedule

Activity	Period
Site Preparation	Completed by 9/12/86
Mobilization	Rotary Rig on site by 9/12/86
	Coring Rig on site by 9/20/86
Set Surface Casing	Completed by 9/20/86
Initiate Coring	9/24/86 (late start)
Total Depth	11/15/86 (early completion)
Completion	11/20/86
Temperature Logging	11/30/86
Abandonment	1/20/87

5.0 Permits

Drilling operations are governed by GRO #4 and the permit stipulations in the BLM and DOGAMI permits. Copies of these permits are enclosed in the Project Institutional Plan.

August 1, 1986

Express Mail

Mr. Bob Fujimoto
Division of Mineral Resources
Oregon State Office
Bureau of Land Management
825 N.E. Multnomah Street
Portland, Oregon 97201

RE: Temperature Gradient Core Hole Drilling - 1986
North and South Newberry, Deschutes National Forest
Mazama I & II Units, Winema National Forest

Dear Bob:

Cal Energy's exploration plans for this field season have now been confirmed, as follows. Begin the North and South Newberry TG core holes on about August 11, the MZI-11A site on about September 1, and (tentatively) the MZII-1 site about September 15, 1986.

Submitted herewith are originals and two copies of Sundry Notices proposing modifications to the Drilling Program for the following holes:

Cal Energy Desig.	BLM Permit	Deschutes NF Permit	DOGAMI Permit	Lease #	Leaseholder
CE-NB-4	OR-920-86-DNB-003		129	OR-11985	Delta Funds
CE-NB-3		5-22-85*	127	OR-12668	Christian F. Murer
MZI-11A	OR-920-85-WN-001		116	OR-34669	Calif. Energy
MZII-1	**		117	OR-34681	Calif. Energy

*Cal Energy has agreed with Deschutes NF that we will comply with the stipulations of BLM's permit issued for CE-NB-4 in the drilling of CE-NB-3.

**We understand that BLM may want to withhold approval of the changes to the MZII-1 hole until near-completion of the MZI-11A hole.

The proposed changes to the downhole program are as follows:

(1) Depth: It is intended to drill up to 5000'±. However, the surface casing will be run to 550' to allow drilling to 5500' if allowed by drilling conditions and if necessary to obtain meaningful data).

(2) Surface casing will be 4-1/2" instead of 5-1/2".

(3) Wireline coring will begin with 3.782 OD (HQ).

RECEIVED
AUG 6 1986

We are also submitting these changes to DOGAMI and the surface managers, by copy of this letter and enclosures.

Please call if you need clarification or further information.

Very truly yours,

Anna K. Carter
Compliance Manager

AKC:41/42

Enclosures

cc: Steve Henderson, BLM Portland (all)
Dennis Simontacchi, BLM Lakeview (all)
Dennis Davis, BLM Prineville (all)

Hal Seigworth, Deschutes NF (CE-NB-3 and CE-NB-4)
Donna Owens, Deschutes NF " "

Art DuFault, Winema NF (MZI-11A and MZII-1)
Marv Stump, Winema NF " "

Dennis Olmstead, DOGAMI (all)

Susan Prestwich, DOE, Idaho Falls (MZI-11A)
Elizabeth Bowhan, DOE, Idaho Falls "

BLM: Geothermal Drilling Permit
No. OR-920-85-WN-001
DOGAMI: 116

Form: USGS 9-1958

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY, CONSERVATION DIVISION

Form Approved
Budget Bureau No. _____

GEOTHERMAL SURVEY NOTICE

The U.S. Geological Survey requests this form or other Supervisor approved form to be prepared and filed in triplicate with requisite attachments with the Supervisor. The Supervisor must approve this permit prior to any lease operations.

4. LEASE SERIAL NO.: OR 34669

5. SURFACE MANAGER: BLM ( ) FS (X) Other ( ): Winema NF

1a. WELL TYPE: PRODUCTION ( ) INJECTION ( ) HEAT EXCHANGE ( ) OBSERVATION ( ) OTHER (X): Temperature Gradient Core Hole

6. UNIT AGREEMENT NAME: Mazama I

1b. WELL STATUS: Not yet drilled.

7. WELL NO.: MZI-11A

8. PERMIT NO.: See above

2. NAME OF LESSEE/OPERATOR: California Energy Company, Inc.

9. FIELD OR AREA: Winema Nat'l Forest

3. ADDRESS OF LESSEE/OPERATOR: 3333 Mendocino Ave., Ste. 100, Santa Rosa, CA 95401

10. SEC., T., R., B.& M.: Sec. 10 T31S R7½E

11. COUNTY: Klamath

12. STATE: Oregon

13. LOCATION OF WELL OR FACILITY: Approx. 2225'E and 725' N of SW Corner Sec. 10 T31S R7½E

14. TYPE OF WORK

CHANGE PLANS	(X)	CONVERT TO INJECTION	( )	PULL OR ALTER CASING	( )
SITE AND ROAD CONSTRUCTION	( )	FRACTURE TEST	( )	MULTIPLE COMPLETE	( )
CONSTRUCT NEW PRODUCTION FACILITIES	( )	SHOOT OR ACIDIZE	( )	ABANDON	( )
ALTER EXISTING PRODUCTION FACILITIES	( )	REPAIR WELL	( )	OTHER	( )

15. DESCRIBE PROPOSED OPERATIONS (Use this space for well activities only. See instructions for current well conditions on reverse)

To change the drilling program to reflect new proposed depth of 5000±. A revised drilling permit form is attached for convenience in documentating the changes. See Items 19 and 21 and attached Drilling & Coring Procedures.

16. DESCRIBE PROPOSED OPERATIONS (Use this space for all activities other than well work)

(Use reverse side if needed)

17. I hereby certify that the foregoing is true and correct

SIGNED James L Moore TITLE Senior Vice President Exploration DATE 7/31/86

James L. Moore

(This space for Federal use)

APPROVED BY _____ TITLE _____ DATE _____

CONDITIONS OF APPROVAL, IF ANY:

This permit is required by Law (30 U.S.C. 1023); regulations: 30 CFR 270.34, 30 CFR 270.35, 30 CFR 270.45, 30 CFR 270.71-1, 30 CFR 270.72; Federal Geothermal Lease Terms and Stipulations and other regulatory requirements. The United States Criminal Code (18 U.S.C. 1001) makes it a criminal offense to make a willfully false statement or representation to any Department or Agency of the United States as to any matter within its jurisdiction.

(See instructions on reverse side)

Form: USGS 9-1957

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY, CONSERVATION DIVISION

Form Approved
Budget Bureau No. _____

GEOTHERMAL DRILLING PERMIT

The U.S. Geological Survey requires this form or other Supervisor approved form to be prepared and filed in triplicate with requisite attachments with the Supervisor. The Supervisor must approve this permit prior to any lease operation.

4. LEASE SERIAL NO.: OR 34669

5. SURFACE MANAGER: BLM ( ) FS (X) Other ( )
Winema National Forest

1a. TYPE OF WORK: DRILL NEW WELL ( ) REDRILL ( ) DEEPEN ( ) PLUG BACK ( ) DIRECTIONALLY DRILL ( ) OTHER (X)
Drill/Core Temperature Gradient Core Hole

6. UNIT AGREEMENT NAME: Mazama I

1b. WELL TYPE: PRODUCTION ( ) INJECTION ( ) HEAT EXCHANGE ( ) OBSERVATION ( ) WATER SUPPLY ( ) OTHER ( )
Temperature Gradient Core Hole

7. WELL NO.: MZI - 11A*

8. PERMIT NO.

1c. WELL STATUS:

9. FIELD OR AREA

2. NAME OF LESSEE/OPERATOR
California Energy Company, Inc. (707) 526-1000

10. SEC. T., R., B.& M.: SE¼,SW¼, Sec. 10 T31S, R7½E Willamette B & M

3. ADDRESS OF LESSEE/OPERATOR
3333 Mendocino Ave., Ste. 100, Santa Rosa, CA 95401

11. COUNTY: Klamath

15. LOCATION OF WELL
At surface: Approx. 2,225 feet east and 725 feet north of the SW corner, Section 10, T31S, R7½E
At proposed prod. zone:

12. STATE: Oregon

16. DISTANCE FROM PROPOSED LOCATION TO NEAREST PROPERTY OR LEASE LINE
Approx. .43 miles SE of MZ I Unit boundary

13. APPROX. STARTING DATE: September 1, 1986

17. DISTANCE FROM PROPOSED LOCATION TO NEAREST WELL, DRILLING, COMPLETED, OR APPLIED FOR ON THIS LEASE
Approx. .6 miles north of MZ I-11

14. ACRES ASSIGNED (WELL SPACING): N/A

18. DRILLING MEDIA AND CHARACTERISTICS: AIR (X) WATER ( ) MUD (X) FOAM ( ) Other ( )

19. PROPOSED DEPTH
MEASURED: 5500'
TRUE VERTICAL:

20. ELEVATIONS: ESTIMATED (X) FINAL ( )
6050'
REFERENCE DATUM: GR (X) MAT ( ) DF ( ) KB ( ) RT ( ) CASINGHEAD FLANGE ( ) OTHER ( )

21. EXISTING AND/OR PROPOSED CASING AND CEMENTING PROGRAM (List existing program first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH Top	SETTING DEPTH Bottom	QUANTITY OF CEMENT
Set 6-7' of	8-5/8" conductor pipe (optional).				Surf.	6-7'	To Surface
7-7/8"	4-1/2"	11.5#	8RD ST&C	K55	Surf.	550'	To Surface

Drill out cement plug and resume drilling with 3.782 OD (HQ) wireline coring system. Reduce core size to 2.980 OD (NQ), as mandated by drilling conditions.

22. PROPOSED WORK SUMMARY

*Approximate Kettleman designation: 47-10.

See attached Proposed Drilling and Coring Procedure.

(Use additional space on reverse side of fo

23.

SIGNED James L. Moore TITLE Senior Vice President Exploration DATE July 31, 1

(This space for Federal use)

APPROVED BY _____ TITLE _____ DATE _____

CONDITIONS OF APPROVAL, IF ANY:

This permit is required by law (30 U.S.C. 1023); regulations: 30 CFR 270.71; Federal Geothermal Lease Terms and Stipulations and other regulatory requ ments. The United States Criminal Code (18 U.S.C. 1001) makes it a criminal offense to make a willfully false statement or representation to any Depar or Agency of the United States as to any matter within its jurisdiction.

(See instructions on reverse side)

PROPOSED DRILLING AND CORING PROCEDURE

All drilling operations will conform with or exceed the safety and environmental protection requirements of the federal Geothermal Resources Operational Orders (GROs), stipulations of the Forest Service, and the Department of Geology and Mineral Industries' Laws and Administrative Rules Relating to Geothermal Exploration and Development in Oregon.

The proposed program for drilling and completion is outlined below. The 4-1/2" surface casing will be set and cemented in a 7-7/8" hole rotary drilled with either mud or air as prescribed by subsurface conditions. The remainder of the hole, 550'-5000'± will be drilled by using conventional wireline coring equipment. With this technique, two progressive reductions in hole size are permitted if 1-1/2" tubing is to be run for final temperature measurement. Previous recent drilling experience from the flanks of Newberry suggests that such a designed program should not have any significant difficulty in reaching the planned total depth of 5000'±.

Drilling Procedures

1. Prepare site and set 7'± of 8-5/8" conductor pipe with back-hoe and cement with Ready-Mix in a 5' x 5' x 7' deep cellar.

2. Move in and rig up a combination core and rotary rig.

3. Spud 7-7/8" hole and drill to 550'+ using a fresh water and gel drilling mud. Standby air drilling equipment will be part of the rig package to aerate the drilling mud if any serious lost circulation is encountered.

4. 4-1/2" casing will be run at 550' and cemented to surface. Surface casing is designed to exceed 10% of total depth.

5. Weld on casing head flange. Nipple up to 4-1/2" casing with a master valve and hydraulic operated annular B.O.P. Pressure test all equipment to 500 psi, with advance notification to USFS/BLM/DOGAMI to witness test.

6. Drill out cement plug to 2' below 4-1/2" casing shoe with HQ core bit.

7. Start wireline core drilling with 3.782' OD bit (HQ) reducing to 2.980 (NQ) as deemed necessary by drilling conditions.

8. At completion, run 1-1/2" tubing to total depth; fill w/water and cap.

9. Run periodic temperature surveys up to one year after completion.

10. After completion of temperature surveys, plug and abandon the hole in conformance with stipulations of the Forest Service, Federal GROs and DOGAMI's Laws and Administrative Rules relating to Geothermal Exploration and Development in Oregon.

BLM: _____

DOGAMI: 117

Form: USGS 9-1958

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY, CONSERVATION DIVISION

Form Approved
Budget Bureau No. _____

GEOTHERMAL SURVEY NOTICE

The U.S. Geological Survey requests this form or other Supervisor approved form to be prepared and filed in triplicate with requisite attachments with the Supervisor. The Supervisor must approve this permit prior to any lease operations.

4. LEASE SERIAL NO.: OR34681

5. SURFACE MANAGER: BLM ( ) FS ( ) Other ( ): Winema N.F.

6. UNIT AGREEMENT NAME: Mazama II

7. WELL NO.: MZII-1

8. PERMIT NO.:

9. FIELD OR AREA:

10. SEC. T., R., B.& M.: Sec. 13, T32S, R6E WM

11. COUNTY: Klamath

12. STATE: Oregon

1a. WELL TYPE: PRODUCTION ( ) INJECTION ( ) HEAT EXCHANGE ( ) OBSERVATION ( ) OTHER (X)
Temperature Gradient Core Hole

1b. WELL STATUS:
Not yet drilled.

2. NAME OF LESSEE/OPERATOR
California Energy Company, Inc.

3. ADDRESS OF LESSEE/OPERATOR
3333 Mendocino Ave., Ste. 100, Santa Rosa, CA 95401

13. LOCATION OF WELL OR FACILITY
2000'N and 2050' W of SE Corner, Section 13

14. TYPE OF WORK

CHANGE PLANS	(X)	CONVERT TO INJECTION	( )	PULL OR ALTER CASING	( )
SITE AND ROAD CONSTRUCTION	( )	FRACTURE TEST	( )	MULTIPLE COMPLETE	( )
CONSTRUCT NEW PRODUCTION FACILITIES	( )	REDOT OR ACIDIZE	( )	ABANDON	( )
ALTER EXISTING PRODUCTION FACILITIES	( )	REPAIR WELL	( )	OTHER	( )

15. DESCRIBE PROPOSED OPERATIONS (Use this space for well activities only. See instructions for current well conditions on reverse)

To change the drilling program to reflect new proposed depth of 5000±. A revised drilling permit form is attached for convenience in documentating the changes. See Items 19 and 21 and attached Drilling & Coring Procedures.

16. DESCRIBE PROPOSED OPERATIONS (Use this space for all activities other than well work)

(Use reverse side if needed)

17. I hereby certify that the foregoing is true and correct

SIGNED James L. Moore TITLE Senior Vice President Exploration DATE 7/31/86

James L. Moore

(This space for Federal use)

APPROVED BY _____ TITLE _____ DATE _____

CONDITIONS OF APPROVAL, IF ANY:

This permit is required by law (30 U.S.C. 1023); regulations: 30 CFR 270.34, 30 CFR 270.35, 30 CFR 270.45, 30 CFR 270.71-1, 30 CFR 270.72; Federal Geothermal Lease Terms and Stipulations and other regulatory requirements. The United States Criminal Code (18 U.S.C. 1001) makes it a criminal offen to make a willfully false statement or representation to any Department or Agency of the United States as to any matter within its jurisdiction.

(See instructions on reverse side)

Form: USGS 9-1957

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY, CONSERVATION DIVISION

Form Approved
Budget Bureau No. _____

GEOTHERMAL DRILLING PERMIT

The U.S. Geological Survey requires this form or other Supervisor approved form to be prepared and filed in triplicate with requisite attachments with the Supervisor. The Supervisor must approve this permit prior to any lease operation.

4. LEASE SERIAL NO.: OR34681

5. SURFACE MANAGER: BLM ( ) FS Winema N.F. Other ( )

1a. TYPE OF WORK: DRILL NEW WELL ( ) REDRILL ( ) DEEPEN ( ) PLUG BACK ( ) DIRECTIONALLY DRILL ( ) OTHER (X) Drill/Core Temperature Gradient Core Hole

6. UNIT AGREEMENT NAME: Mazama II

1b. WELL TYPE: PRODUCTION ( ) INJECTION ( ) HEAT EXCHANGE ( ) OBSERVATION ( ) WATER SUPPLY ( ) OTHER ( )

7. WELL NO.: MZII-1

8. PERMIT

1c. WELL STATUS:

9. FIELD OR AREA

2. NAME OF LESSEE/OPERATOR: California Energy Company, Inc. (707) 526-1000

10. SEC., T., R., B.& M.: Section 13, T32S, R6 WM

3. ADDRESS OF LESSEE/OPERATOR: 3333 Mendocino Ave., Ste. 100, Santa Rosa, CA 95401

15. LOCATION OF WELL
At surface: 2000' N and 2050' W of SE Corner, Section 13
At proposed prod. zone

11. COUNTY: Klamath

16. DISTANCE FROM PROPOSED LOCATION TO NEAREST PROPERTY OR LEASE LINE: Approx. 1600' from Unit Boundary

12. STATE: Oregon

17. DISTANCE FROM PROPOSED LOCATION TO NEAREST WELL, DRILLING, COMPLETED, OR APPLIED FOR ON THIS LEASE: No proposed nor existing geothermal wells.

13. APPROX. STARTING DATE: Sept. 15, 1986

14. ACRES ASSIGNED (WELL SPACING): N/A

18. DRILLING MEDIA AND CHARACTERISTICS: AIR (X) WATER ( ) MUD (X) FOAM ( ) Other ( )

19. PROPOSED DEPTH: MEASURED: 5500' TRUE VERTICAL:

20. ELEVATIONS: ESTIMATED (X) FINAL ( ) 4665'
REFERENCE DATUM: GR (X) MAT ( ) DF ( ) KB ( ) RT CASINGHEAD FLANGE ( ) OTHER ( )

21. EXISTING AND/OR PROPOSED CASING AND CEMENTING PROGRAM (List existing program first, followed by proposed program, and separate by a sufficient sp to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH Top	SETTING DEPTH Bottom	QUANTITY OF CEMENT
Set 6-7' of	8-5/8" conductor pipe (optional).				Surf.	6-7'	To Surface
7-7/8"	4-1/2	11.5#	8RD ST&C	K55	Surf.	550'	To Surface
Drill out cement plug and resume drilling with 3.782 OD (HQ) wireline coring system. Reduce core size to 2.980 OD (NQ), as mandated by drilling conditions.							

22. PROPOSED WORK SUMMARY

See attached Proposed Drilling and Coring Procedure.

(Use additional space on reverse side of f

23.

SIGNED James L. Moore — TITLE Senior Vice President Exploration — DATE July 31, 1

(This space for Federal use)

APPROVED BY _____ TITLE _____ DATE _____

CONDITIONS OF APPROVAL, IF ANY:

This permit is required by law (30 U.S.C. 1023); regulations: 30 CFR 270.71; Federal Geothermal Lease Terms and Stipulations and other regulatory requ ments. The United States Criminal Code (18 U.S.C. 1001) makes it a criminal offense to make a willfully false statement or representation to any Depar or Agency of the United States as to any matter within its jurisdiction.

(See instructions on reverse side)

PROPOSED DRILLING AND CORING PROCEDURE

All drilling operations will conform with or exceed the safety and environmental protection requirements of the federal Geothermal Resources Operational Orders (GROs), stipulations of the Forest Service, and the Department of Geology and Mineral Industries' Laws and Administrative Rules Relating to Geothermal Exploration and Development in Oregon.

The proposed program for drilling and completion is outlined below. The 4-1/2" surface casing will be set and cemented in a 7-7/8" hole rotary drilled with either mud or air as prescribed by subsurface conditions. The remainder of the hole, 550'-5000'± will be drilled by using conventional wireline coring equipment. With this technique, two progressive reductions in hole size are permitted if 1-1/2" tubing is to be run for final temperature measurement. Previous recent drilling experience from the flanks of Newberry suggests that such a designed program should not have any significant difficulty in reaching the planned total depth of 5000'±.

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1. Prepare site and set 7'± of 8-5/8" conductor pipe with back-hoe and cement with Ready-Mix in a 5' x 5' x 7' deep cellar.

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3. Spud 7-7/8" hole and drill to 550'+ using a fresh water and gel drilling mud. Standby air drilling equipment will be part of the rig package to aerate the drilling mud if any serious lost circulation is encountered.

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5. Weld on casing head flange. Nipple up to 4-1/2" casing with a master valve and hydraulic operated annular B.O.P. Pressure test all equipment to 500 psi, with advance notification to USFS/BLM/DOGAMI to witness test.

6. Drill out cement plug to 2' below 4-1/2" casing shoe with HQ core bit.

7. Start wireline core drilling with 3.782' OD bit (HQ) reducing to 2.980 (NQ) as deemed necessary by drilling conditions.

8. At completion, run 1-1/2" tubing to total depth; fill w/water and cap.

9. Run periodic temperature surveys up to one year after completion.

10. After completion of temperature surveys, plug and abandon the hole in conformance with stipulations of the Forest Service, Federal GROs and DOGAMI's Laws and Administrative Rules relating to Geothermal Exploration and Development in Oregon.

August 1, 1986

TO: DISTRIBUTION LIST, Attached

RE: MZI-11A Temperature Gradient Core Hole, Winema NF
Cost- and Data-Sharing with Department of Energy

The U.S. Department of Energy (DOE) will be cost-sharing the drilling of the temperature gradient core hole MZI-11A under Cooperative Agreement No. DE-FC07-86ID12654 with California Energy Company. DOE will be using the support services of E.G.&G. for environmental review and the University of Utah Research Institute (UURI) for geological/technical review and liaison with Cal Energy. As soon as DOE's designated technical support staff are identified to us, we anticipate that there will be convened a meeting or conference call(s) among BLM, Winema NF, DOGAMI, DOE, E.G.&G., UURI and Cal Energy staff to exchange pleasantries.

DOE's involvement and rights to data will in no way alter our reporting requirements to permitting agencies, although it will affect Cal Energy decisions as to what data will be identified as proprietary. Because DOE is cost-sharing this hole, much of the data generated will become public information through Cal Energy reports to DOE and reports generated by UURI or other DOE designates. It has been the experience of DOE personnel that, during drilling, they receive phone calls asking how the hole is doing. Because the hole is being cost-shared with "public funds" some response is appropriate (DOE usually gives the depth reached that day and the date a press release will be forthcoming).

Cal Energy must submit management, technical and institutional plans to DOE that identify Authorities and Responsibilities for all aspects of this project. We have previously submitted copies of all plans and permits and the Environmental Assessment prepared by BLM and Winema NF to DOE. Our Institutional Plan to DOE must identify what data will be released, when, by whom and in what form. We would like to have your input, if any, before formalizing the plan.

Attached is a list of Regulatory Authority and Communications for the Mazama holes, drafted last year after a planning meeting in Klamath Falls with BLM and Winema NF. This list (originally intended for distribution to Cal Energy's staff in the field) will be expanded to add DOE contacts and their designates. Please review the draft list for accuracy and relay your questions, concerns or preferences regarding the coordination of dissemination of information to the public (or any other issue arising from DOE cost-sharing) to Jim Moore, Dave McClain or me at 707-526-1000.

CALIFORNIA ENERGY COMPANY, INC.
3333 MENDOCINO AVENUE, SANTA ROSA, CA 95401 (707)526-1000 TELEX II 510-744-2088

We intend to submit the technical, insitutional and management plans required under the DOE agreement within about ten days and hope to begin drilling this hole by about September 1, 1986.

Very truly yours,

Anna K. Carter
Compliance Manager

AKC:z6242/C5

Enclosure: Authorities and Communications

cc: Jim Moore, Senior Vice President/Exploration
Phil Essner, Vice President/Lands
Bob Pryde, Vice President/Drilling Operations
Gordy Gollan, Drilling Supervisor
Joe LaFleur, Senior Exploration Geologist
Paul Brophy, Senior Geothermal Geologist
Dave McClain, Manager/Project Development
Susan Mitcham, Administrative Assistant, Lands

DISTRIBUTION LIST - 8-01-86

U.S. Bureau of Land Management

Pat Geehan, Deputy State Director for Mineral Resources, Portland
Bob Fujimoto, Physical Scientist,. Division of Mineral Resources, Portland
Jack Feuer, Geologist, Inspections & Enforcement, Portland
Steve Henderson, Petroleum Engineer, Inspections & Enforcement, Portland

Gerry Asher, District Manager, Lakeview
Dennis Simontacchi, Geologist, Lakeview
Dennis Davis, Prineville

Steve Sherman, Area Manager, Klamath Falls Resource Area
Mr. Tom Cottingham, Environmental Specialist, Klamath Falls

U.S. Forest Service

Carlin Jackson, Director, Lands and Minerals, Portland

Art DuFault, Forest Supervisor, Winema National Forest, Klamath Falls
Marv Stump, Energy Coordinator, Winema NF
Ms. Dee Westerberg, Public Information Officer, Winema NF
Tom Neal, Road Maintenance

Bill Jensen, Chemult Ranger District (Mazama I Unit)
Dave Pederson, Klamath Ranger District (Mazama II Unit)

Oregon Department of Geology and Mineral Resources

Don Hull, State Geologist, Portland
Dennis Olmstead, Petroleum Engineer/Geologist, Portland

U.S. Department of Energy

Elizabeth Bowhan, Contract Specialist, R & D Branch, Idaho Falls
Ms. Susan Prestwich, Geologist, Geothermal Program Manager, Idaho Falls

REGULATORY AUTHORITY AND COMMUNICATIONS

The Bureau of Land Management (BLM) and Winema National Forest (Winema) have established the following responsibilities and authorities:

BLM	Drilling compliance/GROs/DOGAMI contact
Winema NF	Surface compliance/GRO 4/Public information.

Jack Feuer, Inspections and Enforcement, BLM Portland (503-231-6991) is responsible for administration of our BLM permits. All communications, however, are to be directed to the contact persons listed below, in the order listed.

DRILLING/DOWNHOLE COMPLIANCE

BLM (Lead Agency):

1st	DENNIS SIMONTACCHI	Day:	503-947-2177
	Inspector, Lakeview	Night:	503-947-2355
2nd	DENNIS DAVIS	Day:	503-447-4115
	Inspector, Bend	Night:	503-382-3440

DOGAMI - Oregon Department of Geology and Mineral Industries:

DENNIS SIMONTACCHI (BLM, above) will handle communications with DOGAMI.

Dennis Olmstead (DOGAMI)	Day:	503-229-5580
	Night:	503-231-3835

California Energy Company:

1st	BOB PRYDE	Field Phone:	Day/Night (to be supplied)
		Santa Rosa:	707-526-1000
		Home:	707-585-2063
2nd	GORDY GOLLAN	Field Phone:	Day/Night (to be supplied)
		Santa Rosa:	707-526-1000
		Home:	707-894-4128

SURFACE: ON- AND OFF-SITE COMPLIANCE
(Site Construction, Water, Roads, Fire):

Winema National Forest (Lead Agency):

1st BILL JENSEN, Chemult Ranger District: 503-365-2229

2nd MARV STUMP, Winema NF, K. Falls: 503-883-6799

BLM:

Dennis Simontacchi 503-947-2177
(Environmental monitoring plan compliance)

California Energy Company:

Field Operations: Bob Pryde/Gordy Gollan

Environmental/Permits/Reports: Dave McClain/Anna Carter

PUBLIC INFORMATION
(Tours, Media Contact, Press Releases, Drillsite Visitors):

Winema National Forest (Lead Agency):

1st DEE WESTERBERG, Public Information Officer: 503-883-6715

2nd ART DUFAULT, Forest Supervisor: 503-883-6714

BLM:

1st STEVE SHERMAN, Klamath Falls Area Manager: 503-883-6916

2nd ED SALIBERTI: 503-883-6916

California Energy Company:

1st*	DAVE McCLAIN	Santa Rosa:	707-526-1000
		Sunriver Ofc:	503-593-2414
		Night:	503-389-2204
2nd*	ANNA CARTER	Santa Rosa:	707-526-1000
		Night:	707-526-7924

*Within Cal Energy, inquiries are to be referred for response as follows:

Public Information - continued

Exploration Planning/Policy	Jim Moore
Land/Lease/Unit Administration	Phil Essner
Geology/Geotechnical/Hydrology	Joe La Fleur/Paul Brophy
Drilling Operations	Bob Pryde/Gordy Gollan/Jim Moore
Environmental Compliance/Monitoring/ Permits-Reports	Dave McClain/Anna Carter

AKC:42:7-85
Z6242

telephone #'s

California Energy Company, Inc.

MAZAMA CORE HOLE MANUAL

Deep Temperature Gradient Core Holes

Winema National Forest
Klamath County, Oregon

August 1986

TABLE OF CONTENTS

MAZAMA I AND II UNITS
Deep Temperature Gradient Core Holes

PERMITS

PLEASE READ ALL PERMITS AND RULES SO THAT YOU WILL BE ABLE TO ANTICIPATE REQUIRED NOTIFICATIONS, TECHNICAL CONSTRAINTS AND REPORTS. READ THE DOE DATA COLLECTION PLAN FOR MZI-11A. SEE MAP AT END POCKET FOR APPROVED ACCESS ROUTES TO THE SITES AND TO WATER SOURCES. KEEP THE SUNRIVER OFFICE INFORMED OF YOUR FIELD HOUSING PHONE NUMBERS.

BLM and WINEMA NF:

BLM and Winema NF have approved a four-hole drilling program. BLM is permitting the holes one at a time and has issued a permit for the MZI-11A site. As soon as we determine whether we are going to drill MZII-1, we must notify BLM.

BLM will be conducting a noise monitoring program. They will give Crater Lake National Park an opportunity to witness any monitoring in the Park. California Energy will be subcontracting a supplemental noise monitoring program.

Winema NF will be conducting fire inspections to ensure compliance with their rules (communication equipment, proper muffling, spark arrestors, fire fighting tools, water, extinguishers, etc.). See USFS Fire Rules for details.

Winema NF has issued a road use permit designating the roads to be used for access to sites. Be especially careful that equipment is restricted to the authorized access route to the MZII-1 hole to the south. HEAVY EQUIPMENT MUST NOT USE THE ANNIE CREEK BRIDGE.

DOGAMI:

BLM and DOGAMI have coordinated their stipulations for the hole (see BLM letter of July 12, 1985). DOGAMI will also receive cuttings from the surface hole and will select core samples from the lithologic log (see DOGAMI letter of August 27, 1986). Dennis Simontacchi, BLM, will handle communications with DOGAMI regarding drilling operations.

OR WATER RESOURCES DEPARTMENT:

OR WRD has issued permits to appropriate water from specific locations for specific well sites. Water withdrawal from sites other than those specified can be done only with concurrence of the Winema NF. Check the authorized water diversion points noted on the maps in the end pocket.

DOE COST SHARING:

DOE is cost-sharing the MZI-11A hole with Cal Energy. In addition to the notices required under the BLM, WNF and DOGAMI permits, we must send a daily drilling report to DOE and the University of Utah Research Institute (UURI). Call in the report to Santa Rosa for typing and transmittal by telecopy. UURI will be providing technical advice to DOE and must be provided access to the drillsite. Please coordinate all media releases through DOE.

AUTHORITIES AND COMMUNICATIONS

The Bureau of Land Management (BLM) and Winema National Forest (WNF) have established the following responsibilities and authorities:

BLM	Drilling compliance/GROs/DOGAMI contact/noise monitoring.
WNF	Surface compliance/GRO 4/Fire/Access/Public information.

Bob Fujimoto, BLM Portland (503-231-6946) is responsible for administration of California Energy BLM permits. Communications are to be directed to the contact persons listed below, in the order listed. See the permits for additional names and numbers if you are unable to reach the partyies named below.

DRILLING/DOWNHOLE COMPLIANCE

BLM (Lead Agency):

1st	DENNIS SIMONTACCHI Inspector, Lakeview	Day: 503-947-2177 Night: 503-947-2355
2nd	DENNIS DAVIS Inspector, Bend	Day: 503-447-4115 Night: 503-382-3440

DOGAMI - Oregon Department of Geology and Mineral Industries:

DENNIS SIMONTACCHI (BLM, above) will handle communications with DOGAMI.

Dennis Olmstead (DOGAMI)	Day: 503-229-5580 Night: 503-231-3835

CALIFORNIA ENERGY COMPANY, INC.:

1st	BOB PRYDE/GORDY GOLLAN	Field Phone: Day/Night (to be supplied) Santa Rosa: 707-526-1000
2nd	DESIGNATED DRILLSITE GEOLOGIST	Field Phone: Day/Night (to be supplied) Santa Rosa: 707-526-1000 Sunriver Office: 503-593-2414
3rd	JIM MOORE	Santa Rosa: 707-526-1000

* For major drilling decisions, coordinate with DOE or their UURI designate.

SURFACE: ON- AND OFF-SITE COMPLIANCE
(Site Construction, Water, Roads, Fire):

WINEMA NATIONAL FOREST (Lead Agency):

1st	BILL JENSEN, Chemult Ranger District:	503-365-2229
2nd	MARV STUMP, Winema NF, K. Falls:	503-883-6799

BLM:

Dennis Simontacchi	503-947-2177

CALIFORNIA ENERGY COMPANY, INC.:

Field Operations: Bob Pryde/Designated Drillsite Geologist

Environmental Monitoring/Permits/Reports: Dave McClain/Anna Carter

PUBLIC INFORMATION
(Media/Public Inquiries, Tours, Press Releases, Drillsite Visitors):

Generally, coordinate any press releases through Winema NF, BLM and DOE.

WINEMA NATIONAL FOREST (Lead Agency):

1st	DEE WESTERBERG, Public Information Officer:	503-883-6715
2nd	ART DUFAULT, Forest Supervisor:	503-883-6714

BLM:

1st	STEVE SHERMAN, Klamath Falls Area Manager:	503-883-6916
2nd	ED CILIBERTI, Chief, Public Info, Portland:	503-231-6274

DOE:

Susan Prestwich, DOE Project Officer	503-526-1147
Pete Mygatt, Director, Office of External Affairs	503-526-1318

PUBLIC INFORMATION
Continued

CALIFORNIA ENERGY COMPANY, INC.:

1st*	DAVE McCLAIN	Santa Rosa:	707-526-1000
2nd*	ANNA CARTER	Santa Rosa:	707-526-1000

*Within Cal Energy, inquiries are to be referred for response as follows:

Exploration Planning/Policy	Jim Moore
Land/Lease/Unit Administration	Phil Essner
Geology/Geotechnical/Hydrology	Joe La Fleur/Paul Brophy
Drilling Operations	Bob Pryde/Jim Moore
Environmental Compliance/Monitoring/ Permits-Reports	Dave McClain/Anna Carter

DOE AND UURI CONTACTS

U.S. DEPARTMENT OF ENERGY (DOE)

Idaho Operations Office
785 DOE Place
Idaho Falls, Id. 94302

Telecopier 208-526-0524 Xerox
208-526-1184 3M
Confirmation 208-526-1503 (Bernice)

Susan Prestwich — 208-526-1147
DOE Project Officer — Home 208-522-3356
Role: Technical Oversight

Elizabeth Bowhan — 208-526-1229
Contracts Specialist
Role: Contract/Finance Oversight

Cliff Clark — 208-526-0457
Role: Environmental Review

Sue Steiger: E.G.& G.
Role: Support to Cliff Clark

Public Relations: Prestwich/Bowhan (for releases prepared by others)

DOE Public Information
Pete Mygatt, Director — 208-526-1318
Office of External Affairs
Role: DOE Generated Releases

UNIVERSITY OF UTAH RESEARCH INSTITUTE (UURI)

391 Chipeta Way
Salt Lake City, Ut. 841-8-1295

Contact Secretary: Beth Orvin 801-524-3422
Carolyn Davidson
Telecopier: 801-524-3453

Role: Technical Advisors to DOE

Mike Wright (Primary contact) — 801-524-3422
Director Earth Science Laboratory — Home 801-277-8330
(Geophysicist)

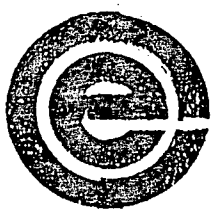
Dennis Nielson, Assoc. Director
Earth Science Laboratory
Geologist - Head Geologic Group

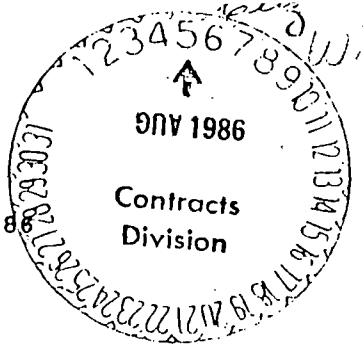
Joe Moore, Head Geochemist Group
Project Geochemist

NOTE: Send copy of all plans as submitted to DOE to Phillip Michael Wright, Director, Earth Science Laboratory, UURI.

CALIFORNIA ENERGY COMPANY, INC.

Santa Rosa Headquarters:	707-526-1000
California Energy Company, Inc. 3333 Mendocino Avenue, Suite 100 Santa Rosa, CA. 95401	
Sunriver Field Office:	503-593-2414 or 2415
California Energy Company, Inc. 201 N Sunriver Plaza Sunriver Business Park P. O. Box 3399 Sunriver, OR. 97702	
Mazama Drillsite Rig Phones - 24 Hours:	503-
Robert A. Pryde/Gordy Gollan - Coso Rig Phones:	619-375-1818
Radio Phone	619-375-1128
Heritage Inn, Ridgecrest	619-446-6543
Bar S Motel, Ridgecrest	619-446-2551
Reference Numbers:	
CTC House, Sunriver, OR.	503-593-2404 (2405)
Thunderbird Motel, Klamath Falls, OR.	503-882-8864
Spring Creek Ranch, Chiloquin, OR.	503-783-2775
Ft. Creek Resort, Ft. Klamath, OR.	503-381-2207





July 30, 1986

Mr. Dennis Olmstead
Petroleum Engineer/Geologist
Oregon Department of Geology
and Mineral Industries
910 State Office Building
1400 S.W. Fifth Avenue
Portland, OR 97201

RE: Agreement between Cal Energy and DOGAMI Regarding Distribution of Core and Cuttings from MZI-11A Hole in the Winema National Forest, Klamath County, Oregon

Dear Dennis:

This letter of agreement outlines and confirms procedures by which the Oregon Department of Geology and Mineral Industries (DOGAMI) will receive selected core and cutting samples from the proposed deep temperature gradient hole MZI-11A to be drilled by California Energy Company, Inc. (Cal Energy). The hole will be drilled with cost sharing funds from the U.S. Department of Energy (DOE) under terms defined by US DOE Agreement No. DE-FC07-86ID 12654 of July 24, 1986.

The following sampling procedures will be adopted for MZI-11A and any other hole drilled by Cal Energy under DOE assistance contracts in Oregon:

1. Cal Energy will rotary drill the surface casing to a maximum depth of 550' with cutting samples taken approximately every 10 feet for routine identification and logging. An additional 100 gram sample will be taken approximately every 30' throughout the rotary drilled section specifically for DOGAMI's use. This sample will be washed, dried, labeled and forwarded to DOGAMI within 60 days of completion of the hole.

2. It is proposed that MZI-11A will be cored from the shoe of the surface casing to total depth (T.D.). A detailed lithologic description of the core with relevant associated data will be compiled and forwarded to DOGAMI following completion of the hole. From the lithologic log DOGAMI will select individual core samples they require for their permanent core repository. It is anticipated that each sample will be four to six inches in length with an approximate maximum of 20 samples throughout the hole. These samples will be collected and documented by Cal Energy and forwarded to DOGAMI within 60 days of selection by DOGAMI.

Susan says OK unless critical area.

3. A courtesy copy of the photographic record of the core will also be forwarded to DOGAMI.

4. Initial storage of all cuttings and cores will be at Cal Energy's field office at Sunriver Business Park, Sunriver, OR. Within one year of completion, cuttings and cores will be transferred to a permanent facility as defined by the DOE cost share Agreement.

5. Cal Energy will provide DOGAMI a copy of the DOE Agreement for their reference.

CALIFORNIA ENERGY COMPANY
333 MENDOCINO AVENUE, SANTA ROSA, CA 95401 (707)526-1000 TELEX II: 510-744-2093

6. DOGAMI will maintain the right at any time to access the complete set of cores and cuttings at either Sunriver or at the permanent storage facility.

7. It is understood that all data provided to DOGAMI by Cal Energy on MZI-11A or other holes or wells from the Mazama Federal units will remain proprietary for a period of at least 8 years pursuant to DOGAMI Board Order of June 7, 1985 unless otherwise agreed by Cal Energy.

We look forward to working with you on this and other geothermal exploration projects in Oregon. Please sign the enclosed copy of this agreement letter and return to our office. Thank you.

Agreed to:

James L. Moore
Senior Vice President Exploration
California Energy Company, Inc.

Date:_____

Agreed to:

Donald Hull, State Geologist
Oregon Department of Geology and
Mineral Industries

Date:_____

PB:lat:42

cc: Donald Hull, DOGAMI
Elizabeth Hyster-Bowhan, DOE
Gerry Asher, BLM Lakeview
Dennis Simontacchi, BLM Lakeview
Dennis Davis, BLM Prineville
Marvin Stump, Winema NF

CALIFORNIA ENERGY COMPANY: GEOTHERMAL EXPLORATION BRIEFING PAPER

Required Decision

The decision requires the selection and implementation of either the proposed action, one of the three alternatives identified in the Environmental Assessment (EA), or other options. The proposed action is drilling up to 24 temperature gradient/core holes, with a maximum of 8 holes drilled in the first field season (originally 1984, now 1985).

Forcing Event

A decision should be made as soon as possible, but no later than the end of the calendar year so that the proponent can make necessary arrangements prior to the next field season.

Background

The initiating event was the submittal of a geothermal Plan of Exploration (POE) by the proponent, California Energy Company, Inc. (Cal Energy). The POE, received by the BLM on March 1, 1984, requested approval to drill up to 24 temperature gradient/core holes on two federal geothermal unit areas on the Winema National Forest, adjacent to Crater Lake National Park. This action follows leasing and unit agreement approvals.

Leasing

Cal Energy was awarded federal geothermal leases totaling approximately 97,000 acres in the Winema National Forest. Cal Energy received concurrent approval for two federal geothermal unit agreements, encompassing approximately 84,000 acres of the 97,000 acre total.

According to the regulations, geothermal leases on Forest Service lands can only be issued with the consent of, and subject to such terms and conditions as may be prescribed by the Forest Service. Usually, the Forest Service prepares an environmental analysis for the lease applications, in order to determine whether the leases should be issued, and with what, if any, stipulations to mitigate or eliminate impacts to surface resources.

All of the federal geothermal leases on the Winema National Forest contain a contingent right stipulation, which states in part: "All operations on this lease are subject to Government approval with such site-specific stipulations as may be necessary to assure reasonable protection of or mitigation of effects on other values. A plan of operations shall not be approved if it results in unacceptable impact on other resources, land uses, and/or the environment."

The contingent right stipulation is a mechanism which allows the Forest

Service to recommend geothermal leasing to the BLM, without first conducting an environmental analysis. With this strategy, the environmental analysis process is postponed until such time that a site-specific, post-lease operation is proposed, and the rights of the lessee are contingent on the results of any environmental analysis.

Unit Agreements

The unit agreements are contractual agreements between the lessees and the Federal government, and allow for the timely and orderly exploration of geothermal resources without regard to individual lease boundaries. There are two approved geothermal unit agreements involved in this POE, Mazama I and Mazama II. Under the combined terms of these unit agreements, Cal Energy is obligated to drill 4 wells within 18 months of the effective date of the agreements (January 1, 1984). The 18 month timeframe will be extended for that period of time required by the Federal government to complete the environmental analysis. The unit obligations escalate during subsequent 12 to 18 month periods.

Plan of Exploration

According to the regulations, a plan of operations and individual drilling permits must be submitted by the lessee or the lessee's representative, and approved by the authorized officer (BLM) prior to commencement of actual drilling operations. Specific types of plans of operations include Plans of Exploration, Injection, and Development.

The Plan of Exploration details the surface use requirements, on a site-specific basis, of the proposed drilling operations, and includes discussions on water use, road and drill pad construction, and measures to prevent or control impacts to other surface resources.

Any approved plan and accompanying drilling permit(s) would include standard design features, including Geothermal Resource Operational (GRO) Orders, and special stipulations. Several key standard design features appropriate to this proposal are:

GRO Order 1, section 5. Drilling fluids or cuttings shall not be discharged onto the surface where such discharge might contaminate lakes and perennial or intermittent streams. Excavated pits or sumps used in drilling shall be backfilled as soon as drilling is completed and restored to conform with the original topography.

GRO Order 3, section 1.A. In uncased portions of wells, cement plugs shall be placed to protect all subsurface mineral resources including fresh water aquifers. Such plugs shall extend a minimum of 100 feet below, if possible, and 100 feet above such zones. Cement plugs shall be placed in a manner necessary to isolate formations, and to protect the fluids in such formations from interzonal migration or contamination.

History of Events

Cal Energy submitted their Plan of Exploration to drill up to 24 temperature gradient/core holes, to a maximum depth of 4000 feet. The plan was received by the BLM on March 1, 1984. Upon receipt of the POE, the BLM Lakeview District, in cooperation with the Winema National Forest, initiated an EA based on the proposed action. An interdisciplinary team was formed from personnel of the Lakeview District and Klamath Falls Resource Area offices of the BLM, and Winema National Forest. Crater Lake National Park staff participated as observers. The following week a summary of the POE was sent out to interested parties, requesting public comments.

On May 11, 1984, the EA was completed and made available for public review and comment. Two letters of comment were received; one from the Sierra Club, and one from the National Park Service Regional Office in Seattle, Washington. Both letters expressed concerns about the potential impacts on the environment, and in particular on Crater Lake National Park, as a result of the proposed drilling operations. In addition, the Regional Director of the Park Service wrote a memorandum to the National Park Service Director, identifying concerns and asking that the issue be brought to their Assistant Secretary, as required by their headquarter's instructions. That memorandum also requested that the Department's Office of Environmental Project Review (OEPR) review the EA.

The State Director, in consideration of ongoing circumstances, wrote a memorandum to the Director (500), stating that the BLM had advised the Park Service Regional Office that while the BLM understands the Park Service concerns regarding potential impacts to Crater Lake National Park, the BLM must follow its own procedures in permit review and NEPA compliance, which call for quality control and issue resolution at the field level. The memorandum went on to state that the State Director's review of the situation continues to strongly confirm that the BLM should resolve concerns at the field level, in coordination with the Park Service and Forest Service.

In light of the concerns expressed, and in keeping with the concept of field level resolution of concerns, the State Director, along with other BLM and Forest Service managers and staff, and representatives of Cal Energy, conducted an on-site field inspection of the proposed drilling sites and neighboring Park lands on June 30, 1984. A National Park Service ranger guided the party around the east rim of Crater Lake. As a result of the inspection, the State Director acquired a better understanding of the proposed action, proximity of operations to the Park, and scope of environmental impacts. On July 3, 1984, the first of two Park Service/Forest Service/BLM meetings to review the EA was held. Also, the State Director requested the Lakeview District, in conjuction with the Winema National Forest, to conduct a public meeting and field trip open to all interested parties.

On July 20, 1984, the public meeting and field trip were held. About 50 people attended, representing the television and print media, U. S. Congressman Bob Smith's staff, State Senator Judy Carnahan, Klamath County Commissioners, the Klamath Indians, various environmental organizations, the Oregon Departments of Fish and Wildlife, Geology and

Minerals Industries, State Lands, and Water Resources, the National Park Service, Forest Service, and BLM. No new concerns were raised during the meeting or field trip.

The EA was subsequently amended, specifically to address the Park Service concerns. BLM, on July 19, 1984, requested the advice of the USGS regarding the hydrologic concerns of the NPS. The USGS replied (copy attached) that "the potential for affecting the flow of hydrothermal fluids into Crater Lake is clearly very small... A second Park Service/Forest Service/BLM meeting was held to review the draft amended EA, and Finding of No Significant Impact (FONSI). The Park Service concluded that, with minor modifications, the amended EA adequately addressed those concerns. The amended EA was revised to incorporate those modifications, and transmitted to the Lakeview District Manager and Winema National Forest Supervisor, along with the FONSI, for signature and concurrence.

Outstanding Issues

The decision is dependent on the following factors:

1. Environmental sensitivities;
2. Drilling concerns;
3. Bureau Mineral Resources Policy;
4. Park Service concerns;
5. Public concerns.

Environmental sensitivities

The amended EA concludes that the following potential environmental consequences are anticipated for the below listed environmental components, as a result of the proposed action or another drilling-related alternative approved with standard and special design features incorporated:

Crater Lake National Park
- short-term increases in dust levels;
- noise levels a nuisance to recreational users at Lost Creek campground and the Pinnacles overlook;
- virtually undetectable intrusions in the scenic quality.

surface water - minor depletion of local water sources.
soils - soil compaction and loss of ground cover (0.2 acres per drill site under all drilling alternatives; increased disturbance associated with road construction under alternative 1).
wildlife - minor and temporary impacts due to some interruption of localized habitat occupancy.
transportation system - minor unavoidable impacts from compaction, surface displacement, dust, and noise due to increased traffic and essential road maintenance.
wood products - no impacts.
threatened and endangered species - no impacts.
cultural resources - no impacts under the proposed action or alternative 2; possible impacts on unidentified cultural resources under alternative 1.
minerals - positive impact due to increased minerals information.
land uses - no impact on existing authorized uses.

The potential for intermingling of geochemically discrete groundwater aquifers would be eliminated by selection and implementation of the hydrologic-related mitigation measure as stated in the EA, "the zones of fluid inflow or fluid loss [in the well] will be required to be sealed."

Noise levels can be controlled with standard design features (Geothermal Resource Operational Order number 4). This GRO Order states, "the lessee shall not exceed a noise level of 65 dB(A) for all geothermal-related activity as measured at the lease boundary line or one-half mile from the source, whichever is greater." Noise levels could be further reduced by selection and implementation of the noise-related mitigation measure as stated in the EA, "no more than one site in the vicinity of MZI-13 and MZI-14 would be drilled simultaneously."

Possible impacts on unidentified cultural resources, resulting from the implementation of Alternative 1 would be eliminated by selection and implementation of the cultural resources-related mitigation measure as stated in the EA, "appropriate [cultural resources] site surveys and mitigation (as needed) would be conducted prior to ground disturbing activities."

Drilling concerns

Two drilling uncertainties are associated with any drilling alternative: the potential for water flowing within a hole between aquifers with different pressure heads; and the potential for a blowout (uncontrolled emissions of fluids and/or gases from a well).

There are no guarantees that either event would not occur; however, standard design features that would be incorporated into any drilling permit would minimize the potential for either of these two occurrences. In addition, it would be prudent to incorporate the mitigation measure regarding intermingling of ground water (see discussion in the environmental uncertainties section above) as contained in the letter from the Director, USGS, to the State Director, even though this measure is a standard design feature. Reiteration of the USGS mitigation measure would: acknowledge the consultation and cooperation of the USGS; notify those parties concerned about the hydrology of Crater Lake that the BLM has treated those concerns with high regard; and single out this standard design feature as being more important than some other standard design features.

With respect to the uncertainty of a blowout, the EA did not discuss in detail the risks associated with such an event. A blowout would be considered an accident, and the U. S. Supreme Court has determined that "a risk of an accident is not an effect on the physical environment," and is therefore beyond the reach of NEPA (Metropolitan Edison v. People Against Nuclear Energy et al., no. 81-2399, decision of April 19, 1983).

Also, the EA did not address mitigation measures to further reduce the potential risks or impacts associated with a blowout, because the standard design features (casing, cementing, and blowout prevention equipment specifications and testing) are more than adequate to maintain effective control of a drilling well. These standard design features incorporate current industry specifications and practices with respect to

GRO Order 4, section 2. Operations under a geothermal lease shall not unreasonably interfere with or endanger operations under any other lease, license, claim, permit, or other authorized use of the same land. GRO Order 4, section 11. The lessee shall conduct noise level measurements during exploration, development, and production operations to determine the potential nuisance to nearby residents as well as the potential health and safety danger to noise emissions. Noise level measurements and accompanying data shall be filed with the authorized officer.

GRO Order 4, section 11.C. The lessee shall not exceed a noise level of 65 dB(A) for all geothermal-related activity including but not limited to exploration, development, or production operations as measured at the lease boundary line or one-half mile from the source, whichever is greater.

Special stipulation. All wells drilled below 500 feet shall be equipped with blowout prevention equipment.

Approval Process

With the consolidation of onshore minerals responsibilities, the BLM has the authority to approve industry operations on all federal leases, regardless of surface ownership or management. The existing nationwide BLM/Forest Service/Geological Survey Memorandum of Understanding for the geothermal program requires concurrence of post-lease operations by the surface management agency.

In order for Cal Energy to enter on the land and start dirt work/drilling operations, the following documents require approval by the authorized officer, and concurrence by the surface management agency, where appropriate:

Document	Authorized Officer	Concurrence
EA	Lakeview DM	Forest Supervisor
FONSI	Lakeview DM	Forest Supervisor
Decision Document	State Director	
Plan of Exploration	Deputy State Director	Forest Supervisor
Drilling Permit	Deputy State Director	Forest Supervisor

In addition, concurrence of the decision will be obtained from the Regional Forester, USFS. Although this concurrence is not required, such action exemplifies the cooperative working relationship between BLM and USFS. The National Park Service Regional Director has been continually advised on BLM's progress on this matter, and will briefed prior to any decision to insure his input and understanding.

A 30-day period should lapse between the date of this decision and its implementation (approval of the Plan of Exploration and the drilling permits) to allow for appropriate protest/appeals.