MINUTE ITEM
This Calendar Item No. C125
was approved as Minute Item
No. 125 by the State Lands
Commission by a vote of 3
to 0 at its 11/15/94
meeting.

CALENDAR ITEM
C125

11/15/94
W 40668
Willard
Kruger

PRC 7810

APPROVE A NEGOTIATED SUBSURFACE GEOTHERMAL RESOURCE LEASE, THE GEYSERS STEAM FIELD, SONOMA COUNTY

APPLICANT:

Calpine Corporation
Attn: Kevin Rupp,
Corporate-Land & Property Tax
50 W. San Fernando, 5th Floor
San Jose, California 95113

AREA, TYPE LAND AND LOCATION:

Approximately 224 acres of State reserved mineral interest land in the northwest portion of The Geysers Geothermal Steam Field, in Sonoma County (see Exhibits "A" and "B" for land description and location map).

LAND USE:

The State has reserved mineral rights in excess of 15,000 acres at The Geysers, with 6,016 acres currently under lease. The reserved mineral interest lands (and in certain cases fee parcels) are a portion of the "school lands" which the State received as a grant from the federal government in 1853 to support public schools. Revenue received from the use of school lands is for the benefit of the State Teacher's Retirement System (STRS). Further leasing must occur if idle State parcels are to be brought into production and thereby eliminate the potential of drainage from wells on adjacent lands.

LEASE TERMS:

1. Primary term of ten years and for so long thereafter as geothermal resources are produced in paying quantities from the leased land, or so long as the Lessee is diligently conducting, producing, drilling, deepening, repairing, redrilling or other necessary lease or well maintenance operations in the leased land.

2. Initial drilling term of three years, subject to extension of one additional year upon approval by the State.

3. Rent of $10 per acre per year, payable in advance.

4. Royalty of twelve and one half percent (12.5%) of the value of steam produced from the leased land. The value of steam is the higher of (a) gross revenue received pursuant to an approved steam sales contract or (b) the ratio of the lease steam delivered to the Aidlin power plant to the total steam delivered to the plant times thirty percent (30%) of the gross revenue received pursuant to the Power Purchase Contract between Mission Energy Company and PG&E.

5. Performance bond or other security in the amount of $50,000.

6. The form of lease will provide for "Subsurface Only - No Surface Use".

BACKGROUND:
On December 17, 1992, the State Lands Commission (Commission) authorized the leasing of those lands within The Geysers area not currently under lease. On June 15, 1993, certain lands were offered for lease by competitive public bid. No bids were received.

Calpine Corporation (Calpine) has submitted an application for a negotiated subsurface geothermal resources lease on approximately 224 acres of reserved mineral interest land not currently leased. These lands are within the area previously authorized for lease by the Commission. All drilling and production operations would be conducted on privately-owned or leased lands by Calpine as operations would not be permitted on the surface of the State leased lands.

STATUTORY AND OTHER REFERENCES:
A. P.R.C.: Div. 6, Parts 1 and 2; Div. 13.

B. Cal. Code Regs.: Title 3, Div. 3; Title 14, Div. 6.

AB 884:
N/A

OTHER PERTINENT INFORMATION:

1. Pursuant to the Commission's delegation of authority and the State CEQA Guidelines (14 Cal. Code Regs. 15025), the staff has prepared an EIR identified as EIR No. 498, State Clearinghouse No. 90030208. Such EIR was prepared and circulated for public review pursuant to the provisions of CEQA and certified by the Commission on June 30, 1992.

   The leasing action in and of itself will not result in any direct impact on the environment. Subsequent geothermal development will have an impact on the environment, and the EIR was an analysis of the potential impacts of the development. Because no specific development has been proposed, the impact analysis represents reasonable worst-case estimates of probable effects without being specific to a project site. Future site-specific projects will be subject to environmental impact analyses and reports. The Commission may not be the Lead Agency for the subsequent exploration and development projects.

2. A Mitigation Monitoring Plan has been prepared for the mitigation of impacts likely to occur subsequent to leasing. Although there will likely be modifications to the mitigation measures and required monitoring as a result of future site-specific environmental studies, the plan does provide an overview of the anticipated measures which will be implemented. Because future activities may be permitted by other state and local agencies, certain monitoring requirements may be delegated to those agencies. However, the Commission will be responsible for assuring full compliance with the plan.

3. Findings made in conformance with Section 15091 of the State CEQA Guidelines are contained in Exhibit "C" attached hereto.

4. A Statement of Overriding Considerations made in conformance with Section 15093 of the State CEQA Guidelines is contained in Exhibit "E" attached hereto.

EXHIBITS:

A. Land Description
B. Location Map
C. CEQA Findings
D. Mitigation Monitoring Plan
E. Statement of Overriding Considerations

IT IS RECOMMENDED THAT THE COMMISSION:

1. DETERMINE THAT A FINAL EIR SCH. NO. 90030208, FOR THE PROPOSED GEOTHERMAL RESOURCES LEASE OF CERTAIN STATE LAND WITHIN THE GEYSERS STEAM FIELD IN SONOMA COUNTY WAS PREPARED AND CERTIFIED BY THE COMMISSION ON JUNE 30, 1992.

2. ADOPT THE FINDINGS, MADE IN CONFORMANCE WITH SECTION 15091 OF THE STATE CEQA GUIDELINES, AS CONTAINED IN EXHIBIT "C", ATTACHED HERETO.

3. ADOPT THE MITIGATION MONITORING PLAN, AS CONTAINED IN EXHIBIT "D", ATTACHED HERETO.

4. ADOPT THE STATEMENT OF OVERRIDING CONSIDERATIONS MADE IN CONFORMATION WITH SECTION 15093 OF THE STATE CEQA GUIDELINES, AS CONTAINED IN EXHIBIT "E", ATTACHED HERETO.

5. DETERMINE THAT A NEGOTIATED GEOTHERMAL RESOURCES LEASE IS IN THE BEST INTEREST OF THE STATE AND AUTHORIZE ISSUANCE TO CALPINE CORPORATION, A GEOTHERMAL RESOURCES LEASE, COVERING THOSE LANDS DESCRIBED IN EXHIBIT "A", ON FILE IN THE OFFICE OF THE COMMISSION.

NO TEXT ON THIS PAGE

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EXHIBIT "A"

LAND DESCRIPTION

Lots 6, 7, 8 and 9, and SE1/4 of NE1/4, and N1/2 of NE1/4, all in Section 4, T11N, R9W, MDB&M, Sonoma County containing 224 acres more or less based upon the Mitchell & Heryford Record of Survey filed in the office of the County Recorder, County of Sonoma, on March 27, 1991 in Book 470 of Maps at Pages 37 & 38 and the Mitchell and Heryford acreage compilation map of May 13, 1994 on file at the State Lands Commission.

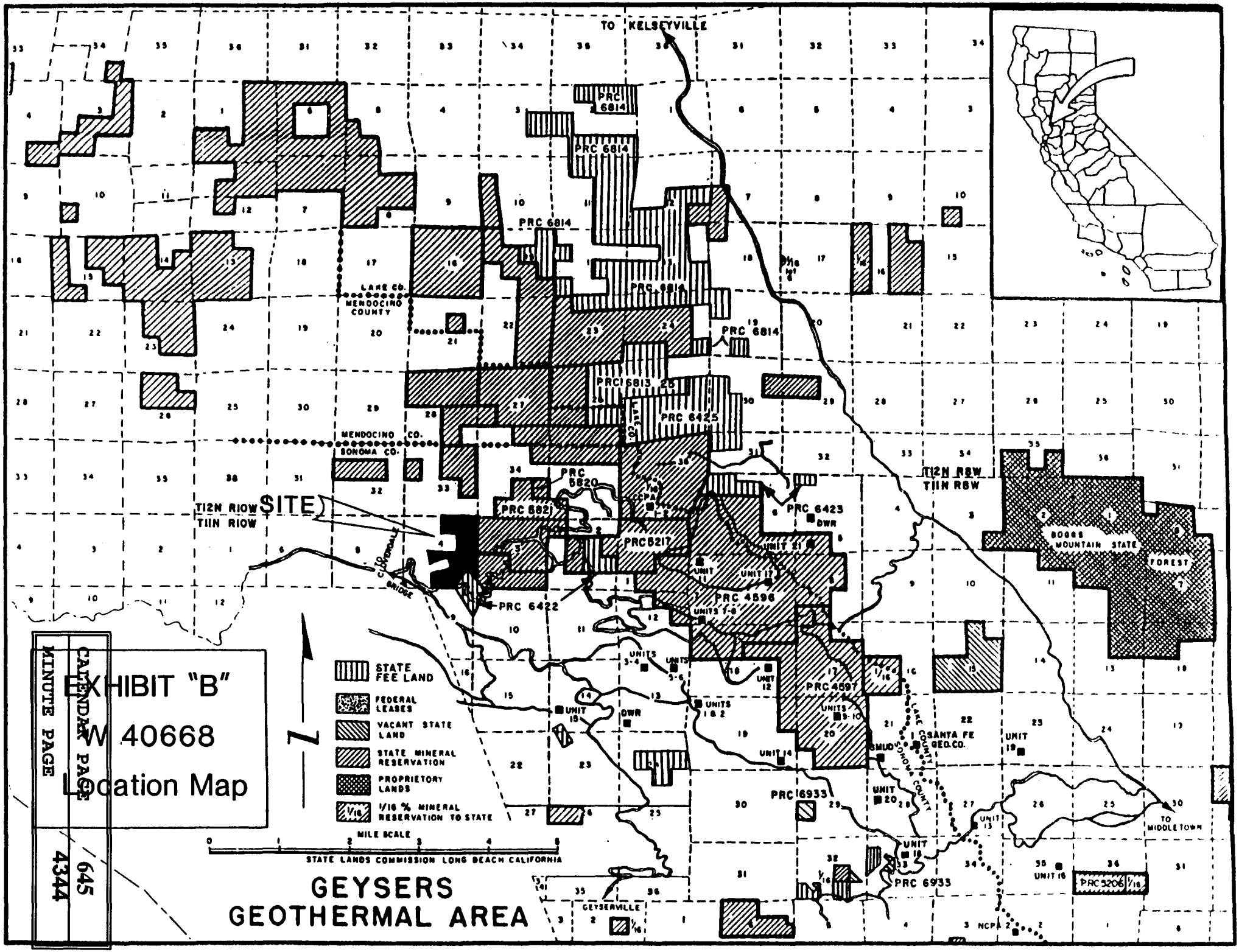

EXHIBIT "B"

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Location Map

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EXHIBIT C -

FINDINGS AND STATEMENT OF OVERRIDING CONSIDERATIONS REGARDING THE ENVIRONMENTAL EFFECTS OF THE GEOTHERMAL DEVELOPMENT OF CERTAIN STATE LANDS WITHIN THE GEYSERS AREA, LAKE, MENDOCINO, AND SONOMA COUNTIES, CALIFORNIA

INTRODUCTION

Herewith are presented the findings made by the State Lands Commission, pursuant to Section 15901, Title 14, California Administrative Code, on the proposed Geothermal Development for certain State Lands within the Geysers Area, Lake, Mendocino, and Sonoma Counties, California. All significant impacts of the project identified in the Final EIR are included herein and organized according to the resource affected (air quality, geology, vegetation, etc.).

For each significant impact, a finding has been made as to one or more of the following as appropriate:

a) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR;

b) Such changes or alterations are within the responsibility and jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by such other agency or can and should be adopted by such other agency; and

c) Specific economic, social and or other considerations make infeasible the mitigation measures or project alternatives identified in the Final EIR.

The appropriate findings are followed by a narrative of the facts supporting them. When possible, reference is made by number to the specific mitigation measure presented in Section 4 of the EIR. For many of the impacts, all three findings described above have been made. Finding b) appears because although the State Lands Commission is the CEQA Lead Agency, it has the jurisdiction over only a portion of the project thus has limited power to require or enforce mitigation. Whenever Finding b) occurs, agencies with jurisdiction have been specified. It is these agencies, within their respective spheres of influence, which would have the ultimate responsibilities to adopt, implement, and enforce the mitigation discussed within each type of potential impact which could result from project implementation. However, under recently adopted California statutory legislation (AB3180, CORTESE), the CEQA Lead Agency has the responsibility to ensure that mitigation measures contained in an EIR are effectively implemented.

Whenever finding c) was made, the State Lands Commission has determined there will be, even after mitigation, an unavoidable significant level of impact due to the project, and sufficient mitigation is not practicable to reduce the impact to a level of insignificance. This impact is

always specifically identified in the supporting discussions. The Statement of Overriding Considerations, applies to all such unavoidable impacts, as required by Sections 15902 and 15903, Title 14, California Administrative Code.

PROJECT BACKGROUND

The proposed leasing of state land for geothermal resource development is a discretionary act that may ultimately commit previous undeveloped areas to long-term industrial activity. The leasing action itself, which is under the jurisdiction of the State Lands Commission, results in no direct physical impact to the environment. The subsequent phases of activity (non-drilling exploration, exploratory drilling, lease development, operation and maintenance, and abandonment) do result in environmental impacts that will be concentrated within the three specific project areas. Impacts will occur in the form of areal disruption and loss or restriction of present land use functions. Areas will be transformed from undisturbed rural uses to industrial uses. Areas of incompatibility with sensitive land uses or nearby sensitive receptors such as biological habitats, residences, or recreational uses may result even with adherence to policies related to buffering and facility siting. The extent of potential conflict will vary and is dependent on the ultimate amount of development that may occur within the project boundary. No specific subsequent development projects have been proposed, thus the impact analyses represents reasonable worst-case forecasts of probable effects without being specific to a project site.

The exploratory drilling and geothermal field and plant development stages will involve additional discretionary action by local governmental agencies and may require additional or supplemental site-specific environmental analyses and/or more specific mitigation measures in addition to those provided herein. Any additional or supplemental CEQA documents would be prepared by local agencies with jurisdiction over development permitting. For leasing Project Area No. 1, the County of Sonoma is the local agency with jurisdiction. For leasing Project Area No. 2, the Counties of Sonoma, Lake and Mendocino have jurisdiction, depending upon where in the area geothermal development is proposed. For leasing Project Area No. 3, Lake County is the local agency with jurisdiction.

It is noted that the mitigation measures presented herein are derived from various sources and are considered a compendium of the available measures which have been included in previous projects and/or which have been adopted as standards by local agencies. These measures together represent model of development conditions, which when applied to future geothermal development, will achieve a large measure of protection for the unique environmental and human features of The Geysers area.

SYSTEMS SAFETY: Non-Drilling Exploration Activities

Impact: Offroad vehicle operation will increase the possibility of wildland fires.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

Facts Supporting the Finding:

Exploration activities will include off-road vehicle operations in brushy and/or forested wildland areas. During such operations, a vehicle could ignite a wildland fire as a result of tailpipe sparks, or if brush contacted a hot catalytic converter. A wildland fire could also result from exploration personnel carelessly disposing of a cigarette, or if a campfire was improperly extinguished or left unattended.

Mitigation measures to eliminate ignition sources have been proposed which shall be implemented to reduce these impacts to insignificant levels. These measures include:

- All vehicles and motorized equipment shall be equipped with a CDF-approved spark arrestor (FEIR Mitigation Measure #1).

- All personnel involved in exploratory activities will be prohibited from smoking at any time in wildland or forested areas. Further, all personnel will be prohibited from building campfires while in wildland or forested areas (FEIR Mitigation Measure #2).

SYSTEMS SAFETY: Exploratory Drilling

Impact: There is a potential for blowout of a well during exploratory drilling which could cause death or injury to site personnel.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

Facts Supporting the Finding:

By definition, exploratory drilling involves advancing the drill string into subsurface regions of uncertain lithologic and geothermal composition (i.e., liquid or vapor dominated) and unknown temperature and pressure. Thus, there is a potential for encountering unanticipated conditions, resulting in an upset, loss of well control and ultimately, a blowout. A blowout could release steam, water, and/or toxic gases such as hydrogen sulfide or ammonia. Both of these gases are toxic in relatively concentrations, and therefore might pose a significant threat of injury or death to on site personnel, if such an upset condition occurred.

Mitigation measures regulating operating procedures and requiring special safety equipment have been proposed which shall be implemented to reduce these impacts to insignificant levels. These measures include:

- o During all drilling operations, down-hole conditions, (such as temperature, pressure, drilling fluid returns, and other system components) will be carefully monitored such that approach to high pressure zones, including geothermal zones is forewarned (FEIR Mitigation Measure #3).

- o Casing anchored Blowout Prevention Equipment (BOPE) will be installed on all wells, and drilling fluid balance will maintained to ensure well control (FEIR Mitigation Measure #4).

SYSTEMS SAFETY: Full Field Development

Impact: There is a potential for construction activities to ignite a significant wildland brush or forest fire.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties).

Facts Supporting the Finding:

Development of the geothermal field will likely require the installation and construction of field facilities such as pipelines, heat exchangers, pumps, cooling towers, turbine generators and other ancillary equipment. During construction of these facilities, there will be potential for ignition of a significant brush or forest fire. This potential will be heightened because of the substantial amount of welding required during construction.

The potential for a wildland fire resulting from construction-related activity will be reduced to an insignificant level by implementing the following mitigation measures:

- o All development and work areas including pipeline routes will be cleared of brush, weeds, and other combustible materials to a distance recommended by the CDF (FEIR Mitigation Measure #5).

- o Reconstruct or consolidate existing transmission facilities and corridors to accommodate additional line capacity in an environmentally sound manner (FEIR Mitigation Measure #6).

SYSTEMS SAFETY: Operation and Maintenance

Impact: Accidents could occur during facilities maintenance operations, (particularly a welding ignited fire.)

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties).

Facts Supporting the Finding:

At a national level, welding activities associated with maintenance and repair are one of the leading causes of industrial fires. In the geothermal field, maintenance welding may be conducted at virtually any location in the vicinity of well heads, pipelines, or power plant equipment. Maintenance welding could ignite a fire due to the sparks and hot material generated.

The potential for a welding initiated fire resulting from maintenance activities will be reduced to an insignificant level by implementing measures to inspect welding areas prior to initiation of work as follows:

- o During field operation, all maintenance and repair welding locations will be inspected prior to the start of work, and all combustible materials will be removed to a distance well beyond which any sparks or flames could travel. In addition, a large ABC class fire extinguisher will be close at hand during all maintenance and repair work (FEIR Mitigation Measure #7).

SYSTEMS SAFETY: Operation and Maintenance

Impact: Handling hazardous materials and hazardous waste could result in a significant accident causing significant adverse environmental impact.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such

agencies (Lake, Sonoma and Mendocino Counties; California Regional Water Quality Control Board; and Caltrans).

Facts Supporting the Finding:

Gases surfacing with the geothermal steam can include hydrogen sulfide and ammonia, both extremely hazardous at relatively low concentrations. NIOSH/OSHA (1985) defines the concentration of hazardous chemicals that is "Immediately Dangerous to Life and Health" (IDLH) as that maximum level from which a person can escape within 30 minutes without experiencing any escape-impairing or irreversible health effects. For hydrogen sulfide the IDLH concentration is 300 parts per million, and for ammonia is 500 parts per million. Hydrogen sulfide may be lethal at concentrations of approximately 1,000 ppm. Therefore, even in the event of a low concentration of either of these gases in the geothermal well production, a release or leak could pose significant risk to persons in the area of the leak or release.

Designated hazardous materials are utilized in various portions of the drilling and operation of geothermal resource recovery operations. During well flow-testing, it is frequently necessary to inject two hazardous materials, sodium hydroxide and hydrogen peroxide, to scrub the H_2S from the produced steam. The nonhazardous by-products, Na_2SO_4 and $NaHSO_4$, are separated from the produced steam and deposited in the mud sump.

Hazardous and designated wastes generated during geothermal development have the potential for contaminating surface and ground waters if not handled properly in the following manner; on-site accidental waste spills, leaking on-site containment basins or vessels, accidents during transport of waste to off-site facilities, spills and leaking containment basins at off-site county disposal facilities, and illegal disposal of the waste.

The following measures requiring worker training, mutual aid for emergency response, and establishment of standards for worker exposure to hazards have been adopted by State Lands Commission to mitigate the impacts of geothermal development relative to systems safety. It is recommended that local agencies adopt these measures during the site development permit process.

- All personnel working on or near the gas abatement system equipment or components will be instructed in the hazards of the toxic gases and trained in the observation (by odor) of the gases and in the proper steps to be taken in the event of gas detection. The prime action to be taken in the event of gas odor is generally evacuation, with return only when equipped with proper respirator equipment. In addition, an H_2S monitor should be provided, capable of issuing an alarm H_2S at a concentration greater than 10 ppm is detected (FEIR Mitigation Measure #8).

- Developers of geothermal resources will be required to participate in an area of mutual benefit agreement for the purpose of development of a unified emergency notification and communication system linking the geothermal facilities, the California Department of Forestry, the Lake, Mendocino, and Sonoma County Sheriffs' Offices, and possibly other

agencies. This system may be integrated with the Lake County Sheriff Department central dispatch service (FEIR Mitigation Measure #9).

- Hazardous wastes generated will be packaged, manifested, and transported according to applicable state and federal regulations, and disposed of at a Waste Management Unit properly permitted by the applicable Regional Water Quality Control Board for acceptance of the specific type and composition of waste (FEIR Mitigation Measure #10).

- On-site minimization of hazardous wastes, such as dehydration or other physical phase separation, and the use of well-drilling and other process techniques which eliminate or reduce the volume of hazardous wastes produced will be employed to the maximum extent practicable (FEIR Mitigation Measure #11).

- Personnel responsible for handling lubrication oils and diesel fuel will be schooled in proper care and handling (FEIR Mitigation Measure #12).

- The operator of any leasehold will ensure that any hazardous waste hauler employed has a certificate of registration from the California Department of Health Services (CDHS), Hazardous Materials Management Section (FEIR Mitigation Measure #13).

- Standards for occupational exposure, ambient air and water quality exist for certain geothermal contaminants. Threshold Limit Values (TLVs) for other contaminants have been adopted by the American Conference of Governmental Industrial Hygienists. EPA has developed "Multimedia Environmental Goals" (MEGs) for a large number of pollutants. Potential impacts from exposure to or accidental discharge of geothermal related chemicals can be mitigated by strict enforcement of applicable standards, compliance with emission limitations and discharge prohibitions, and compliance with federal, state, and local laws which regulate the safe handling, transport, and disposal to toxic/hazardous materials. A compliance monitoring program will be formulated for approval by SLC for each leasehold (FEIR Mitigation Measure #14).

- Drilling activities shall occur in a manner that minimizes the generation of hazardous materials and waste, allows for their recycling whenever practical, and is in compliance with all waste management policies and regulations. The use of BAKER tanks and sumpless drilling shall be encouraged, particularly when located within 500 ft of blue line water features (FEIR Mitigation Measure #15).

- Project operators shall ensure that the transport of hazardous material or waste is minimized whenever possible and is accomplished in a safe manner (FEIR Mitigation Measure #16).

- Each operator shall prepare a viable contingency plan for emergencies due to breaks or unexpected deformation of pipelines or its supports. The plan shall show who is responsible and what equipment and manpower is available to respond to such an emergency (FEIR Mitigation Measure #17).

- The transportation of hazardous and toxic material can be reduced through support of research and development of alternative methods for handling and minimizing wastes on-site (FEIR Mitigation Measure #18).

- An inspection will be conducted on each truck hauling toxic or hazardous materials prior to leaving the leasehold. The inspection will include brakes, vehicle connection, wheels/tires, valves, tanks, etc. After loading, a material inspection for leaks in the system will be conducted. All inspections will be logged for later verification if necessary, by CHP, CDHS, or other appropriate agencies (FEIR Mitigation Measure #19).

- Participation in driver safety programs for all drivers of waste transport vehicles will reduce the potential for accidents and spills (FEIR Mitigation Measure #20).

- Hazardous and designated wastes generated from geothermal activities in the leaseholds will be collected, contained, transported, and disposed of in accordance with all regulations as specified and enforced by the California Regional Water Quality Control Board and the CDHS under RCRA (FEIR Mitigation Measure #21).

- Emergency response procedures shall be developed to contain hazardous waste spills which occur during transport on and off of the proposed leaseholds (FEIR Mitigation Measure #22).

The mitigation measures described above will reduce the significant adverse impacts to levels considered acceptable and therefore insignificant, with the exceptions of the following two impacts:

- The potential for significant adverse impact associated with accidental release of hazardous materials during Exploratory drilling, Field Development, and Operation and Maintenance cannot be fully mitigated to insignificance.

- The potential for significant adverse impact associated with an accidental release or improper disposal of hazardous wastes during Exploratory Drilling, Field Development, and Operation and Maintenance cannot be fully mitigated.

Unlike other environmental resource areas, impacts related to system safety cannot be associated with a specific significance threshold in every sense. System safety impacts, significant or not, occur only in the event of abnormal system operation. If the system operates normally and as designed, there are no direct system safety impacts. However, the potential for an accident, upset, or release of hazardous or toxic material always exists, despite mitigation measures designed to minimize this potential. Here, the potential, however small, for adverse impacts due to the use of hazardous materials or the generation of hazardous wastes, occurring as a result of abnormal or improper system operation, is identified as an unavoidable and significant adverse impact. Such impact may, in fact, never occur.

The EIR evaluated several alternatives which could have the potential to reduce or eliminate the identified environmental impacts.

No Project Alternative

Implementation of the No Project Alternative would mean that the State Lands Commission would not offer any of the lands within the study area for leasing for geothermal resources. These resources would remain undeveloped for the foreseeable future. From the standpoint of the unavoidable adverse impacts listed above, adoption of this alternative would eliminate the impacts.

It is noted however, that the No Project Alternative would deny the State of California revenues from the leasing program. Also since the steam resource of The Geysers area is diminishing, the resources on the site may diminish over time so that development may not be cost feasible in the future. The energy lost by the No Project Alternative would need to be made up from some other source, most probably fossil fuels.

Leasing Portions of the Project Areas

This alternative involves leasing one or two of the three project areas identified for prospective leasing. The reasons for omitting any particular leasing area could be numerous; however, this analysis assumes that the reason would be to avoid emissions of hazardous gases and hazardous wastes. Emissions of hazardous substances has a potential for occurrence with aspects of geothermal activity involving exploratory drilling, and field development and operations. Since this alternative does eliminate such activity, the unavoidable adverse impacts could still occur.

Prohibiting Construction of Power Plants

This alternative would allow construction of steam fields in the area, but not development of new power plants. Emissions of hazardous substances has a potential for occurrence with aspects of geothermal activity involving exploratory drilling, and field development and operations. Since this alternative does eliminate such activity, the unavoidable adverse impacts could still occur.

Alternative Land Uses

This alternative is based on the assumption that the State Lands Commission could encourage alternative land uses, other than geothermal uses, to be established on the leasehold areas. The State Lands Commission is limited in its ability to establish or encourage land uses beyond its jurisdiction to lease lands for resource and mineral development. Local land use approvals for any use subsequent to leasing are under the purview of the local county governments with jurisdiction. The state does own the lands on Cobb Mountain within the designated lease area and would have some land use authority there. Uses other than geothermal development would not involve hazards from geothermal gases and fluids.

Alternative Technology

This alternative assumes that alternative technologies could be implemented to exploit the geothermal resources of the project areas. The need for implementation of alternative technologies has several purposes, including the reduction in the physical environmental impacts of more traditional geothermal development, and the extension of the life of The Geysers steam field through conservation and more efficient use of the resources. However, this alternative does not eliminate the need for drilling and extraction of geothermal resources nor the associated hazards involved with toxic materials.

In conclusion, only the No Project and Alternative Land Use Alternatives have been shown to reduce the unavoidable systems safety impacts. Neither of these alternatives allow the State Lands Commission to fulfill its obligations under the Geothermal Resources Act and are not considered feasible, not withstanding efforts by State Lands Commission to minimize to the extent practicable, the significant adverse impacts relative to systems safety associated the proposed action.

SYSTEMS SAFETY: Abandonment

Impact: Demolition activities may ignite a wildland or forest fire.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; County Air Pollution Control Districts; California Division of Oil and Gas; California Regional Water Quality Control Board; Caltrans; California Energy Commission; California Public Utilities Commission).

Facts Supporting the Finding:

The abandonment process will include activities similar to those described for the construction phase of the project. Thus, there is an analogous potential for demolition activities to ignite a wildland or forest fire. Sparks and hot material generated by cutting torches pose a particular fire threat during demolition.

Mitigation measures described for the construction and operational phases of the project will continue to be implemented during the abandonment process. Specifically, demolition areas will be inspected and cleared of all combustible material prior to the initiation of all work, and a large ABC class fire extinguisher will be close at hand at all times.

SYSTEMS SAFETY: Abandonment

Impact: Abandonment may result in the accumulation of hazardous waste as equipment, pumps, sumps, pipelines, etc. are dismantled.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; California Division of Oil and Gas; and California Regional Water Quality Control Board).

Facts Supporting the Finding:

During the abandonment process, hazardous waste could accumulate as equipment, pumps, sumps, pipelines, etc. are dismantled. The potential for adverse impacts resulting from the accumulation of hazardous waste during the dismantling and abandonment phase of the project will be reduced to an insignificant level by implementing the following mitigation measures:

- Mitigation measures as imposed during construction and operations shall be imposed (FEIR Mitigation Measure # 23).

- A reclamation plan will be submitted to the applicable local planning agency prior to abandonment of the project. All wells will be abandoned in accordance with Division of Oil and Gas and SLC guidelines and regulations for leased lands (FEIR Mitigation Measure # 24).

- As part of any approved operating plan, testing of inactive or abandoned sumps shall be required and, if necessary, long-term monitoring for ground and surface water contamination shall be implemented. All sumps shall be fenced or otherwise protected to prevent access by persons or animals (FEIR Mitigation Measure #25).

The mitigation measures described above will reduce the significant adverse impacts to levels considered acceptable and therefore insignificant

SYSTEMS SAFETY: Cumulative Impacts

Impact: Cumulatively, geothermal projects considered will lead to an increase in the incidence of wildland brush or forest fires.

Finding: A) Changes or alteration have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

Facts Supporting the Finding:

All phases of geothermal development involve some risk of igniting a wildland fire due to the incursion of humans and machinery into wildland areas. Particular hazards are associated with the operation of motor vehicles in brushy areas, as well as the use of welding equipment, generators, etc.

Fire suppression mitigation measures described for other construction and operational phases of the project will be implemented during the abandonment process.

SYSTEMS SAFETY: Cumulative Impacts

Impact: The cumulative geothermal projects will increase the amount of hazardous gases released to the atmosphere and will generate significant quantities of hazardous waste which must be contained, handled, and disposed of.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; County Air Pollution Control Districts; and California Regional Water Quality Control Board.

C) Specific economic, social and or other considerations make infeasible the mitigation measures or project alternatives identified in the Final EIR.

Facts Supporting the Finding:

The cumulative geothermal developments will increase the amount of hazardous gases, such as hydrogen sulfide and ammonia, released to the atmosphere during drilling, testing, and operation phases. Such releases would have significant adverse impact on employees and could seriously affect nearby vegetation. Abatement measures as described for project-specific impacts could be applied to reduce the likelihood of a significant impact from such discharges.

Geothermal operations resulting from cumulative development levels will generate significant quantities of known hazardous wastes which must be contained, handled, and disposed of in accordance with state and federal law. Significant adverse impacts can occur from waste disposal due to accidental waste spills on-site, leaking on-site containment basins or vessels,

accidents during transport of waste to off-site disposal facilities, spills and leaking containment basins at off-site county disposal facilities, and illegal disposal of wastes. Presently, there are no hazardous waste disposal sites in Lake County, and the two sites that were accepting nonhazardous geothermal wastes have been closed since 1985 due to regulatory violations (County of Lake, 1989). Most hazardous waste must be transported to the Chemical Waste Management disposal facility near Kettleman Hills, California, with minor amounts going to other sites in Utah and Idaho.

The following measures supporting establishment of geothermal waste facilities in the area, advanced technology with respect to drilling and production, and development of Risk Management and Prevention Plans have been adopted by State Lands Commission to mitigate the cumulative impacts of geothermal development relative to systems safety. It is recommended that local agencies adopt these measures during the site development permit process and implement site-specific impact measures discussed above.

- State Lands Commission should support the establishment of geothermal waste facilities in The Geysers area. This will reduce waste vehicle miles travelled and correspondingly reduce accident potential (FEIR Mitigation Measure # 26).

- State Lands Commission should support and implement to the extent possible technological changes in operations, such as incorporation of mechanical water/drilling mud separation technologies, and chemical processes, such as the conversion of hydrogen sulfide to a water soluble sulfur compound (by burning or other chemical reaction) allowing the compound to be injected back into the reservoir with steam condensate. These have great potential to reduce hazardous waste disposal requirements (FEIR Mitigation Measure #27).

- The proposed project will involve acutely hazardous materials (AHMs) such as ammonia and hydrogen sulfide. California law (Health and Safety Code Section 25531 et seq.) requires preparation of a Risk Management and Prevention Program (RMPP) for all facilities involving AHMs in amounts greater than the threshold planning quantities listed in Part 335, Appendix A, Title 40 of the Code of Federal Regulations. The requirements for a RMPP and the procedures for its certification are established by regulation. A RMPP includes a formalized hazardous operations study (HAZOPS). A HAZOPS is designed to identify system safety deficiencies which may result from equipment failure, improper operation, or outside influences, and to provide corrective actions (mitigation) as necessary. The proposed project must cause a RMPP to be prepared and submitted prior to start-up, as required by law (FEIR Mitigation Measure #28).

As was the case with hazardous materials impacts on a site-specific basis, the cumulative impacts from hazardous materials associated with geothermal development are also significant and unavoidable. Specifically, the following impacts are not mitigated to insignificance by the stated mitigation measures:

- The potential for significant adverse impact associated with accidental release of hazardous materials during Exploratory drilling, Field Development, and Operation and Maintenance cannot be fully mitigated to insignificance.

- The potential for significant adverse impact associated with an accidental release or improper disposal of hazardous wastes during Exploratory Drilling, Field Development, and Operation and Maintenance cannot be fully mitigated.

Findings regarding the potential for alternatives to be implemented lead to the same conclusions as stated previously for site-specific systems safety impacts. Only the No Project and Alternative Land Use Alternatives have been shown to reduce the unavoidable systems safety impacts. Neither of these alternatives allow the State Lands Commission to fulfill its obligations under the Geothermal Resources Act and are not considered feasible, not withstanding efforts by State Lands Commission to minimize to the extent practicable, the significant adverse impacts relative to systems safety associated the proposed action.

LAND USE: Exploratory Drilling

Impact: Land transformation will occur as a result of access roadway construction and pad development for exploratory drilling. This includes cut and fill activity which will alter existing topography and landform.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

Facts Supporting Finding:

In its undeveloped state, the project site sustains a variety of functions. It serves as protective watershed and habitat lands, allows for private landowner recreation and hunting, and results in a general open space ambience. The intrusion of geothermal development will significantly disrupt these values by removal of vegetative cover and increase in erosion potential.

Mendocino, Sonoma, and Lake Counties have policies which guide the development of project activities related to industrial development. Facility siting is subject to certain setback requirements under these policies. For example, buffer zones are to be established around sensitive biological/vegetation resource areas (such as near streams). There are various common restrictions such as those for construction on steep slopes due to landslide potential, restrictions on facility placement at set distances from residences and sensitive receptors for noise buffering, and avoidance to the extent possible of siting facilities on ridgelines or within sensitive viewsheds. These requirements are normally made a condition of approval at the permitting phase of a particular facility and are assessed on an individual project basis.

In addition to these typical policies and regulations, the following additional mitigation measures limiting land area disturbance will be implemented;

- Exploratory drilling activities shall disturb the minimum amount of land area possible (FEIR Mitigation Measure #1). To ensure that land disturbance is minimized, the project development proceed will be conducted in accordance with all state and local permit requirements. Mitigation monitoring programs should provide the necessary control to assure compliance with the permit requirements. Measures to minimize land disturbance and amount of land surface will be implemented including limitations on cut and fill activity, sharing of roadways and certain facilities (possibly maintenance areas) where applicable, directional drilling, and locating well sites as close as possible to plants. All disturbed areas will be revegetated as soon as possible and all debris and excess material and equipment will be removed.

Upon implementation of the mitigation measures described above, the significant adverse impacts will be reduced to levels considered acceptable and therefore insignificant.

LAND USE: **Lease Development, Operation and Maintenance**

Impact: Impact of development of geothermal resources on the leaseholds and geothermal operations and maintenance activities will result in significant land use compatibility impacts, including; disruption of vegetative cover and wildlife carrying capacity, increased erosion potential from grading and site development, and development of industrial facilities (roads, pipelines and transmission facilities) which could divide the areas into isolated parcels disturbing the natural habitat.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility and jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by such other agency or can and should be adopted by such other agency (Lake, Sonoma and Mendocino Counties).

Facts Supporting Finding:

If deemed commercially viable, lease development will occur including the construction and operation of the power plant. Construction activity will include additional access roads, transmission and pipeline corridors, and pads for plants, maintenance facilities, and other related structures. A land use transformation occurs in the form of a previously undisturbed rural area being transformed to an industrial use area. While generally maintaining the same basic landform, alterations from cut and fill work and construction of these structures will criss-cross the terrain.

Mendocino, Sonoma, and Lake Counties all have General Plans which guide the development of project activities related to industrial development. In addition, ~~Lake County has an adopted~~

geothermal element which is designed to provide planning guidance for geothermal projects and is meant to work with the General Plan. Sonoma County has such an element in draft form. Because the various county policies regarding land use are designed to allow for geothermal leasing and development within the proposed project boundary, no impacts to land use from a regulatory standpoint are anticipated. The proposed leasing program is in compliance with these local goals and objectives to encourage geothermal energy development.

These planning elements define to varying degrees the policies that pertain to geothermal development for all resource areas. Facility siting is subject to certain setback requirements which are indirectly related to land use. For example, these requirements are directly related to establishing buffer zones around sensitive biological/vegetation resource areas (such as near streams), restrictions on construction on steep slopes due to landslide potential, restrictions on facility placement at set distances from residences and sensitive receptors for noise buffering, and avoidance to the extent possible of siting facilities on ridgelines or within sensitive viewsheds. These requirements are normally made a condition of the permit requirements for a particular facility and are assessed on an individual project basis.

In order to mitigate the impacts of geothermal development on land use, the measures involving viewpoint/interpretive displays, resident education, minimizing land area disturbed and consolidation of facilities have been adopted by State Lands Commission. It is recommended that local agencies adopt these measures during the site development permit process.

- Some local residents are not aware of the geothermal activity in the area, nor of the various potential uses of the geothermal resources. The respective counties should require the establishment of a viewpoint/interpretive display to help educate local residents and visitors regarding the proposed project and the beneficial uses of geothermal energy (FEIR Mitigation Measure #2).

- Mitigation measures to ensure that land disturbance is minimized include that project development proceed in accordance with all state and local permit requirements. Mitigation monitoring programs should provide the necessary control to assure compliance with the permit requirements (FEIR Mitigation Measure #3).

- Measures to minimize land disturbance and amount of land surface will be implemented including limitations on cut and fill activity, sharing of roadways and certain facilities (possibly maintenance areas) where applicable, directional drilling, and locating well sites as close as possible to plants. All disturbed areas will be revegetated as soon as possible and all debris and excess material and equipment will be removed. Transmission line construction will be in adherence with CEC criteria and will be consolidated when possible with the existing PG&E system (FEIR Mitigation Measure #4).

- Space-consuming towers and diagonal alignments of transmission lines and facilities through agricultural fields will be avoided. Where possible, transmission lines will follow property lines or routes with the least environmental and land use impacts (FEIR Mitigation Measure #5).

- Long spans between transmission towers may be utilized at stream crossings to prevent disturbance to stream banks and riparian vegetation (FEIR Mitigation Measure #6).

- Landscaping around periphery of well islands or power plant facilities will assist in shielding residences and casual observers from any undesirable or incompatible views of the facilities (FEIR Mitigation Measure #7).

- Revegetation during construction requires careful plant species selection. Revegetation with many species is, in the long run, the most successful. Often immediate erosion problems can be checked by hydromulching of various grasses. Instead of using fast-growing non-native grasses, an alternative would be to cover bare soil with a coating straw. Straw would absorb raindrop impact and act as a mulch for viable seed buried in the soil (FEIR Mitigation Measure #8).

- Measures to mitigate potential impacts to residential users include adherence to buffering requirements set forth through county guidelines for noise, visual affects, air quality, and other areas (FEIR Mitigation Measure #9).

- Hunting activities and issues related to both hunter safety and plant personnel safety from stray shots may require the restriction of recreational or hunting with areas proximate to energy-generating facilities (FEIR Mitigation Measure #10).

Upon implementation of the mitigation measures described above, the significant adverse impacts will be reduced to levels considered acceptable and therefore insignificant.

LAND USE: **Abandonment**

Impact: Abandonment of operations has the potential to create long-term degradation from site development grading.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility and jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by such other agency or can and should be adopted by such other agency (Lake, Sonoma and Mendocino Counties; California Division of Oil and Gas; and California Regional Water Quality Control Board).

Facts Supporting Finding:

When properly conducted, abandonment activities including proper site restoration and revegetation, will over time allow areas to substantially recover from geothermal development. As with operational requirements, there are standard requirements ~~in local agency plans and~~

regulations regarding abandonment that are normally made a condition of the permitting for abandonment activities on an individual project basis.

The proposed mitigation for abandonment includes a number of measures for specific resource impacts (for instance, grading, runoff, aesthetics, etc.) which are discussed under each resource topic in these findings and are not repeated here. However, the following measure has been adopted relative to impacts of abandonment on land use;

- Revegetation during construction requires careful plant species selection. Revegetation with many species is, in the long run, the most successful. Often immediate erosion problems can be checked by hydromulching of various grasses. Instead of using fast-growing non-native grasses, an alternative would be to cover bare soil with a coating straw. Straw would absorb raindrop impact and act as a mulch for viable seed buried in the soil (FEIR Mitigation Measure #11).

Upon implementation of the mitigation measure described above, the significant adverse impacts will be reduced to levels considered acceptable and therefore insignificant.

PHYSIOGRAPHY AND GEOLOGY: Non-Drilling Exploration

Impact: Non-Drilling related exploratory activities have potentially significant impacts from use of seismic sounding vehicles, potential use of explosives and shallow drilling activities.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; County Air Pollution Control Districts; and California Division of Oil and Gas).

Facts Supporting the Finding:

Gravity, magnetometer, resistivity, and geochemical surveys along with field mapping and surveying would have little impact on the study area. All of these operations require one or two field people and all of the vehicular traffic can be confined to existing roadways. The only potential impact that can be attributable to this type of field activity is the potential for an accidental forest fire due to the negligence of field personnel.

Seismic studies would involve the use of a vibrating energy source or small explosive charges. Under normal circumstances, the study points are located along existing roadways. While the instrumentation of seismic studies causes no environmental impacts~~, the energy source presents~~

potential environmental impacts. If a vibratory source is used, roads are required to move the truck carrying the source. If explosives are used, hand auger holes are used for small explosive charges. The larger charges required for deeper prospecting do require drilling 15- to 30-km (50- to 100-foot) blast holes drilled with a portable drill rig.

Thermal gradient wells require the drilling of small diameter shallow test holes. This drilling requires the use of small self-contained truck mounted drill rigs. Where existing roads do not serve the areas where exploration is needed, paths will need to be cut.

These impacts can be reduced to a level of insignificance through implementation of measures requiring truck mounted drill rigs for geophysical exploration and preparation of plans of exploration, as follows:

- o The use of truck mounted and/or core type drill rigs for temperature gradient or deep geophysical investigations shall be encouraged (FEIR Mitigation Measure #1).

- o A plan of exploration shall be prepared and submitted to SLC prior to commencement of any exploratory activities. Said plan shall delineate the proposed site access, exploratory methods, equipment used, and required land form on subsurface modification. Based upon the plan, SLC may place conditions and or other restrictions on exploratory activities (FEIR Mitigation Measure #2).

PHYSIOGRAPHY AND GEOLOGY: Exploratory Drilling

Impact: Exploratory drilling operations will have significant adverse impacts due to drill pad and road grading, devegetation, and potential erosion hazards.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; and California Regional Water Quality Control Board).

Facts Supporting the Finding:

The primary concern of exploration drilling operations that will impact the area are:

- Drill sites or pads
- Access roadways
- Drilling operations
- Well testing

The most acceptable locations for drill pads are on the ridges and moderately sloping hillsides. Placement of drill pads in these locations will almost eliminate the potential for landslide hazards by keeping the pads off of the steep slopes and valley floors.

The least desirable locations for drilling pads are the steep slopes of the area and the valley floors. Steep slopes all have a potential for developing into landslides or being damaged from landslides developed higher on the same slopes. Much more construction is needed for this type of pad with the resulting increase in damage and impact to the natural surroundings. Pads positioned in the valley floors have the potential of being damaged from landslide debris and flooding during times of heavy rainfall.

Measures to mitigate exploratory drilling impacts include a requirement for geotechnical investigations, hazard mapping, and grading performance standards as listed below:

- Geotechnical investigations for design of facilities should be done for the following purposes: 1) to explore and evaluate soil, groundwater, and subsurface geologic conditions; 2) to evaluate site stability under static and earthquake conditions; 3) to assess the potential for reserve pit leakage; and 4) to provide soil engineering criteria for proposed grading. The investigation would be based on adequate surface and subsurface exportation, laboratory testing, and engineering analyses (FEIR Mitigation Measure #3).

- Updated mapping of existing and potential landslide areas and other geological hazards in the project area should be encouraged and supported (FEIR Mitigation Measure #4).

- Site-specific topographic maps should be prepared of site facilities for project design purposes. The maps may be prepared by either photogrammetric methods and/or by ground survey. The maps should be of sufficient scale and detail to allow the preparation of accurate design drawings (FEIR Mitigation Measure #5).

- Copies of finalized design plans, construction specifications, and geotechnical reports should be submitted to the local Public Works and Planning Departments for review and approval prior to construction activity (FEIR Mitigation Measure #6).

- Civil engineering and geotechnical studies should be undertaken for the design of new road alignments and, as needed, for improving existing road (FEIR Mitigation Measure #7).

- The mitigation measures suggested for pad construction and design are (FEIR Mitigation Measure #8):

    - Have each pad and/or fill designed by a licensed civil engineer with all design based on adequate exploration, testing, and analysis.
    - Pads shall be compacted to a minimum of 90 percent relative compaction.
    - Filled slope banks should not exceed a gradient of 1.5:1. Toes of fills should be stabilized with rock and gravel or keyed into stable soil.
    - Pads should be designed on the basis of balanced cut and fill, whenever possible.

- Hillside storage of spoilage should be avoided whenever possible.
- Provisions must be made for adequate surface drainage from pad surfaces into the nearest stream course.
- Subdrains should be provided under fills where natural drainage courses and seepage are evident.
- Fill and cut slopes should be seeded, mulched, and fertilized as soon as possible.
- If the pad is for drilling, the actual location of the well(s) (if possible) should be in that portion of the pad where the cut was made.

o The mitigation measures suggested for construction of road alignments are in general the same as those for pad construction (see above) plus the following (FEIR Mitigation Measure #9):

  - To gain access to the project areas, use should be made of the existing road network in order to minimize the amount of new access roads that would have to be constructed.
  - Keep road width to a minimum.
  - On hillsides the road surface should slope into the hillside.
  - Culverts and drainage ditches should be installed as necessary. They should be of adequate size, properly lined, and regularly inspected to be sure the are functioning.

o Particular restriction should be placed on operating tractors and vehicles up and down hills, where hill and gully erosion can result. Construction zones should be shown on plans, flagged on the ground, and compliance made a part of all agreements (FEIR Mitigation Measure #10).

o Energy dissipators should be installed at all outfalls in weathered rock (FEIR Mitigation Measure #11).

o Roads should not be placed where slopes exceed 33.5 percent. Road base should be graded, compacted, and surfaced (FEIR Mitigation Measure #12).

o All grading activity shall be completed and all drainage structure shall be in place and operational prior to October 1 of any year when possible (FEIR Mitigation Measure #13).

o To be on the safe side, lost circulation problems should be anticipated during the thermal gradient phase by the lessee and a program to minimize such problems should be developed beforehand for implementation. Only non-toxic, biodegradable drilling fluids should be used (FEIR Mitigation Measure #14).

o Prior to the filling of sumps, sump fluids (both mud and supernatant liquids) shall be chemically analyzed, upon request from the Planning Department, for type and quantity of biologically sensitive materials, especially hazardous materials, heavy metals, and acids (FEIR Mitigation Measure #15).

- If analysis does not indicate quantities in excess of allowable limits for either human or other important biological elements, especially those of the aquatic ecosystem, then sump materials shall be solidified, dried, mixed with native soil and buried. Hazardous or biologically sensitive materials found will be disposed of properly. Sump pits shall be refilled to a stable grade and be revegetated as required (FEIR Mitigation Measure #16).

Upon implementation of the mitigation measure described above, the significant adverse impacts will be reduced to levels considered acceptable and therefore insignificant.

PHYSIOGRAPHY AND GEOLOGY: Lease Development

Impact: The significant impacts that will result to the geology and physiography as a result of lease development as it pertains to well field development, steam conveyance, power generation facility construction, and transmission facility construction are:

- Considerable alteration of the topography in the development area This alteration will include slopes and vegetation.
- Modification of the drainage in the area of the development areas and change in water run off patterns.
- Construction activities will expose bare ground which will result in increased erosion in the development areas.
- Local sloughing, slumping, and sliding of steep hill side grades.
- Increased potential for landslide due to exposed cuts and porous fills.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties and California Division of Oil and Gas).

Facts Supporting the Finding:

The extent of geothermal development which will occur within the project areas cannot be predicted until results from the exploratory wells are known. The primary concerns of development drilling operations that will impact the area are the same as those listed above for exploratory drilling, including the impacts of development additional access roads, drill pads, and hazards during well drilling and testing.

Lease development also includes construction of a steam gathering system, and possible additional power generation and transmission facilities. This aspect of operations will have potentially significant impacts on the physiography of the area.

The significant impacts that will result to the geology and physiography as a result of lease development can be mitigated to insignificance by implementing many of the grading performance standards as described previously as well as additional measures as follows:

- All measures included under Exploratory Drilling would apply to the Lease Development phase (FEIR Mitigation Measure #17).

- If a well pad and reserve pit are to be reactivated following the drilling of the initial exploratory well, they should first be inspected by a geotechnical and civil engineer to assess threat condition and suitability for reuse. Particular care should be given to reserve pit inspection to identify possible damage or deterioration to the impermeable liner material (FEIR Mitigation Measure #18).

- It is the County of Sonoma's policy to encourage power plant design that is appropriate for the resource. The design should provide for conservation of the resource and minimize plant emissions (FEIR Mitigation Measure #19).

- Viability of side casting of soil and rock spoilage depends upon volume, type of material, slope composition, slope stability, and riparian drainage. Where casting is to be prohibited, an acceptable debris disposed areas shall be identified (FEIR Mitigation Measure #20).

- Structures should not be sited on, across or adjacent to unstable landslides unless complete landslide repair is feasible (FEIR Mitigation Measure #21).

- In all areas, but especially those with high soil erodibility, minimum removal of vegetation is advisable (FEIR Mitigation Measure #22).

- Cut and fill slope ratios exceeding 33.5 percent should be avoided. Projects on steeper areas can proceed only after substantial evidence of safety prepared by a registered engineering geologist (FEIR Mitigation Measure #23).

- Large sliver fills shall be avoided (FEIR Mitigation Measure #24).

- Where engineered fills and culverts are to be placed across gullies and streams, it is preferable to use material with a high rock content in order to reduce siltation problems. Less desirable, but acceptable, would be the careful riprapping of compacted soil. Hydrologic studies should be done for culvert sizing purposes (FEIR Mitigation Measure #25).

- Those segments of the road alignments where casting is to be so prohibited should be identified for the applicant's maintenance crews, and acceptable areas for the debris disposal located (FEIR Mitigation Measure #26).

- A retaining levee of not less than 18 inches in height and three feet in base thickness shall be placed on the perimeter of all fill areas including access road fills, pad sites, and waste sumps, to prevent storm runoff accumulation from random discharge (FEIR Mitigation Measure #27).

- Anchor points for stream crossings should be located as far from the active channel as feasible (i.e., on the order of 100 feet). This will reduce the potential for soil and rock generated from pipeline corridor to intercept runoff and reduce soil erosion (FEIR Mitigation Measure #28).

- Cuttings from the bore hole and associated drilling fluids should be disposed of according to state and county requirements (FEIR Mitigation Measure #29).

- The operator shall comply with all federal, state, and local standards with respect to the control of all forms of air, land, water and noise pollution, including, but not limited to, the control of erosion and disposal of liquid, solid, and gaseous wastes (FEIR Mitigation Measure #30).

- In the event of development of a hot water resource, an inventory and analyses of fresh water wells within 1/2-mile of the project shall be made prior to the reinjection of any geothermal effluent from testing or production. At the property owner's option, the developer shall annually test such wells for compliance with state water quality control standards (FEIR Mitigation Measure #31).

PHYSIOGRAPHY AND GEOLOGY: Operations and Maintenance

Impact: The potential significant impacts that are associated with operation and maintenance include damaging settlements and/or failure of the earthwork, failure or leakage of surface pits constructed, surface rupture damage through the site, liquefaction of the site, damage due to settlement or subsidence as a result of steam withdrawal, damage from volcanic ash fall or lava flows, and collapse of facilities into natural or manmade caverns.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such

agencies (Lake, Sonoma and Mendocino Counties; California Division of Oil and Gas; and California Regional Water Quality Control Board).

Facts Supporting the Finding:

During the operations and maintenance phase, little additional surface disturbance will occur. Impacts are limited to possible occurrences ranging from failure of previous work to regional geotechnical or seismic events. The likelihood of these events occurring ranges from minor to remote.

The following measures incorporating specific site maintenance requirements are proposed to reduce the impacts to insignificance as follows:

- Culverts, ditches, trash racks, and other facilities of development sites shall be regularly cleaned and maintained, particularly just before and during the wet season. Such maintenance is necessary to reduce damage to these facilities and subsequent erosion/siltation problems (FEIR Mitigation Measure #32).

- A program of long-term site project maintenance should be developed and implemented by the applicant to ensure continued performance of project components (FEIR Mitigation Measure #33).

- If a drill pad is to be used following a period of deactivation, it should first be inspected by a civil engineer and engineering geologist to evaluate its conditions and to recommend repairs as necessary. Particular care should be given to the waste sump liner to ensure that it is repaired or replaced as necessary (FEIR Mitigation Measure #34).

PHYSIOGRAPHY AND GEOLOGY: Abandonment

Impact: During the abandonment and restoration process, the significant environmental impacts that can be expected are similar to those encountered during the development phase except that generally less effort is required to recontour sites than to initially clear and grade them.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; County Air Pollution Control Districts; California Division of Oil and Gas; California Regional Water Quality Control Board).

Facts Supporting the Finding:

Once the resource has been depleted or the practicality of using the resource has passed, the project must be abandoned and the sites restored to a shape as near the original as possible. Abandonment will include dismantling and removal of equipment, plugging of the wells, removal of pipelines and regrading the sites and roads to their near original condition.

Impacts of abandonment will be mitigated to levels of insignificance by implementing measures requiring restoration, revegetation, and erosion control, as follows:

- o In the event that steam in commercial quantities is not discovered or the field is completely utilized, the pads should be abandoned according to all existing federal, state, and local requirements and regulations, including scarifying the pad surface, placing stockpiled topsoil on the pad, fertilizing as required, and planting with suitable grasses and/or shrubs (FEIR Mitigation Measure #35).

- o If, upon completion of drilling, an access road is to be abandoned, it should be done according to good engineering practice with permanent drainage facilities installed (FEIR Mitigation Measure #36).

PHYSIOGRAPHY AND GEOLOGY: Geothermal Resource Utilization-Resource Depletion

Impact: The primary significant adverse impact caused by utilization of the geothermal resource is the lack of future benefits caused by depletion.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; California Division of Oil and Gas; California Regional Water Quality Control Board; and California Energy Commission).

C) Specific economic, social and or other considerations make infeasible the mitigation measures or project alternatives identified in the Final EIR.

Facts Supporting the Finding:

As discussed in Section 3.3.6.2 of the FEIR, recent study has concluded that a properly planned injection project can extract additional heat from the formation and positively impact both the reservoir pressure and flowrate while minimizing thermal breakthrough to the offset wells. The estimated field life using volumetric analysis is 108 years and using heat recovery analysis is

60 years. In addition, installation of energy conserving features within the geothermal energy production process will have the benefit of improving power generation efficiency.

Without injection, Shook and Faulder (1991) have projected (at the current rate of production) the reservoir would be depleted within 15 years. In 12 years, over 95 percent of the mass initially present would be produced and only about 4 percent of the energy recovered. The model indicated that by injecting 30 percent of the mass produced, energy recovery would increase by 35 percent, to a total of 5.4 percent of the energy in place.

When Shook and Faulder (1991) modeled the reservoir using 60 percent injection, quenching had an appreciable immediate negative impact on energy production as indicated by the delay in heat extracted. However, this large amount of injection increased the life of the reservoir. When model was terminated at 40 year duration, approximately 40 percent of the recoverable mass still remained. This amount was on the order of the mass initially in place, thus they concluded that the energy extraction could nearly be doubled with a reservoir fluid injection program. Unfortunately, to attain an injected mass exceeding the amount of condensate water available from the energy generation will impact other very limited water sources in the region. It is noted that these data are estimates and that the actual benefits of injection are not precisely known.

Because reservoir injection is believed to improve energy recovery, the following measures to conserve the resource have been adopted to address resource depletion:

- The most effective mitigation measure is conservation of the resource during energy production. However, since The Geysers energy production is an alternate energy source for fossil fuels the premiss of using a substitute energy source is non-viable (FEIR Mitigation Measure #37).

- By using operational measures such as cycling, load following, and puffing (shut down and then reopening) increased conservation of the resource is achieved by delivering loads in a cyclic manner consistent with demand. In that each source is somewhat unique, each of these measures would need to be reviewed in depth prior to large scale implementation (FEIR Mitigation Measure #38).

- By installing binary recovery equipment the lower-pressure lower-temperature steam exhausted from the typical six stage turbines systems used can capture additional energy. This would increase overall plant efficiency and conserve the resource (FEIR Mitigation Measure #39).

- In order to mitigate fluid loss from the reservoir, current injection of process water from the plants could be supplemented with additional process water, impoundment water, municipal water, or sewage effluent. Extra process water could be derived if more efficient cooling towers are constructed. Water from impoundments would require the construction of such, as well as collection and distribution systems. This is undesirable for it would be land intensive. Municipal water, if used, would draw upon the domestic and agricultural water supply and would create other impacts. ~~Using effluent from a~~

nearby public works facility would require construction of a delivery system. With any of these efforts there remains the unknown consequences of artificially recharging the reservoir in higher quantities (FEIR Mitigation Measure #40).

Though some effort to develop surface water resources for geothermal purposes has occurred in The Geysers, it is recognized that sources of water for reinjection are very limited. Groundwater is not abundant enough nor adequately recharged to supply a secondary source of injection water. For this reason the operators do not use it, except wells are maintained on some leases for fire fighting purposes and potable water.

The construction of impoundments on any of the local water course, of a size adequate enough to contribute a substantial amount of water for reinjection, would have significant negative impacts. There have been proposals to transport water from several locations south of the project area via pipeline to The Geysers area, including up to 4 million gallons of treated wastewater per day initially. Constraints to wastewater injection include costs and cooperation of geothermal companies for implementation. Complete analysis of short-term and long-term impacts of wastewater injection warrants further study.

Consequently, it is not known whether any reinjection program (as mitigation) is feasible. Also, before any injection program could be implemented, additional research on the steam reservoir and its mechanics must be completed. A study is presently underway. Based on the uncertainties of research results and water availability, any additional development of the steam resource at The Geysers is considered to exacerbate the resource depletion in locations where the steam production rates are declining.

The EIR evaluated several alternatives which could have the potential to reduce or eliminate the identified environmental impacts of resource depletion.

No Project Alternative

Implementation of the No Project Alternative would mean that the State Lands Commission would not offer any of the lands within the study area for leasing for geothermal resources. These resources would remain undeveloped for the foreseeable future. From the standpoint of the unavoidable adverse impact of depletion of the geothermal resource, adoption of this alternative would reduce but not eliminate the impact. Existing operations have had major impact on resource depletion and may or may not cooperate in conservation if it negative affects existing resource production.

Leasing Portions of the Project Areas

This alternative involves leasing one or two of the three project areas identified for prospective leasing. The reasons for omitting any particular leasing area could be numerous; however, this analysis assumes that the reason would be lessen demand for reinjection fluids. While this alternative could perhaps accomplish that purpose, it would not have any effect of reversing resource decline relative to existing operations.

Prohibiting Construction of Power Plants

This alternative would allow construction of steam fields in the area, but not development of new power plants. Since this alternative does eliminate such activity, the unavoidable adverse impacts of resource depletion would still occur.

Alternative Land Uses

This alternative is based on the assumption that the State Lands Commission could encourage alternative land uses, other than geothermal uses, to be established on the leasehold areas. The State Lands Commission is limited in its ability to establish or encourage land uses beyond its jurisdiction to lease lands for resource and mineral development. Local land use approvals for any use subsequent to leasing are under the purview of the local county governments with jurisdiction. The state does own the lands on Cobb Mountain within the designated lease area and would have some land use authority there. Uses other than geothermal development do not affect the problem of resource depletion from existing operations.

Alternative Technology

This alternative assumes that alternative technologies could be implemented to exploit the geothermal resources of the project areas. The need for implementation of alternative technologies has several purposes, including the reduction in the physical environmental impacts of more traditional geothermal development, and the extension of the life of The Geysers steam field through conservation and more efficient use of the resources. However, this alternative does not eliminate the need for drilling and extraction of geothermal resources, but by better use of thermal conversion technology, it is possible to reinject a larger portion of the fluids originally extracted.

In conclusion, the No Project, Alternative Technology and Alternative Land Use Alternatives could lessen, but not eliminate the unavoidable impacts of resource depletion at The Geysers. None of these alternatives allow the State Lands Commission to fulfill its obligations under the Geothermal Resources Act and are not considered feasible. The issue of resource depletion must be addressed on an industry-wide basis at the Geysers and the State Lands Commission definitely encourages geothermal operators to implement resource conservation measures at The Geysers.

It is possible that potential new resource locations, however, may be separate pockets of steam resource which are not interrelated to adjacent formations and, as such, development would not contribute to overall resource depletion. An example of this is the Aidlin Field in the northwest area of The Geysers. If development of these individual pockets is postponed, the opportunity might be lost to connect these wells into existing plant delivery networks and/or plants. Since the existing networks and plants might become obsolete or need retirement, the remaining reservoir pockets would not be economically viable to pursue later. This is one major reason for pursuing the proposed leasing at this time rather than reserving options for leasing at some future date.

PHYSIOGRAPHY AND GEOLOGY: Geothermal Resource Utilization-Debilitation of Resource

Impact: Significant adverse impacts will potentially occur from injecting too much water back into the formation or in the wrong location or depth resulting in drowning or thermal breakthrough.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; County Air Pollution Control Districts; California Division of Oil and Gas; and California Regional Water Quality Control Board).

Facts Supporting the Finding:

Drowning causes a phase change reducing the steam to water or making it "wetter". This term would be associated with a pronounced effect on a large area. Thermal breakthrough is associated with injecting too close or shallow relative to a producing well and affecting its production rate. A remote or improbable form of debilitation can also occur from the injection of water that may contaminate (i.e., high in total dissolved solids) the reservoir with material which would adversely effect steam extraction, the generation process equipment, air quality emissions, or process waste water discharge quality.

The significant impacts of resource debilitation can be mitigated to insignificance by incorporating voluntary control measures as follows:

- Geothermal developments occurring on SLC leasing areas shall be conducted in a manner that is consistent with the Interim Coordinated Resource Management Plan for The Geysers, including compliance with future finalization or modifications of the plan that is necessary to conserve the steam resource (FEIR Mitigation Measure #41).

PHYSIOGRAPHY AND GEOLOGY: Geothermal Resource Utilization-Induced Ground Displacement

Impact: A secondary impact of drawing off the resource is surface displacement caused by relief of subsurface pressure. The settlement may then induce seismicity, or seismicity may occur alone. Observed effects of induced ground displacement have been relatively minor at The Geysers, however, the impact is considered potentially significant.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; California Division of Oil and Gas; and California Regional Water Quality Control Board).

C) Specific economic, social and or other considerations make infeasible the mitigation measures or project alternatives identified in the Final EIR.

Facts Supporting the Finding:

Localized ground subsidence from reduction of fluid pressure in The Geysers has been addressed by Lofgren (1981). Reported was a maximum vertical compression of the reservoir rock of 14 cm (5-1/2 in.) over a 4-1/2 year period. This study was done from 1972-1977.

The data suggest that declines in deep reservoir pressure and rates of horizontal and vertical displacement are greatest soon after new sources of steam are put on line, and diminish as recharge gradients reach a steady state.

The adopted mitigation for induced ground displacement is recharging the reservoir as stated in the following measure:

- Subsidence and induced seismic activities are mitigable by recharging the reservoir by injection. However, for lack of better knowledge on the reservoir the effectiveness in quantifying control of displacement is hardly predictable. Localized displacement has little impact and requires little mitigation (FEIR Mitigation Measure #42).

This impact is considered unavoidable and not mitigated by measures that can be implemented by operators. Ground subsidence has been attributed to geothermal resource extraction and can be reduced by fluid injection. The degree of fluid injection required to offset subsidence is not presently known, therefore, no effective mitigation measure is available.

The EIR evaluated several alternatives which could have the potential to reduce or eliminate the identified environmental impacts of ground subsidence. Of the alternatives considered, and identified previously, the No Project, Alternative Technology and Alternative Land Use Alternatives could lessen, but not eliminate the unavoidable impacts of ground subsidence at The Geysers. The impacts would be reduced by minimizing or eliminating the need for extraction of additional quantities of steam from the area. None of these alternatives allow the State Lands Commission to fulfill its obligations under the Geothermal Resources Act and are not considered feasible.

PHYSIOGRAPHY AND GEOLOGY: Geothermal Resource Utilization-Induced Seismicity

Impact: Micro earthquake activity in The Geysers area has been directly attributed to the withdrawal of the steam resource and is considered a potential significant adverse impact.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; California Division of Oil and Gas; and California Regional Water Quality Control Board).

C) Specific economic, social and or other considerations make infeasible the mitigation measures or project alternatives identified in the Final EIR.

Facts Supporting the Finding:

Eberhardt-Phillips and Oppenheimer (1984) have attributed seismic activity to steam withdrawal. Lipman, Strobel, and Gulati (1978) identified two main clusters of microearthquakes with two independent pressure sinks resulting from steam production. Micro earthquakes are defined as those up to a Richter scale magnitude of 3, due to movement in limited fault lengths of less than 1.6 km (1 mile). Contraction of the reservoir rock causes micro faulting when existing stresses in the formation are relieved.

Current seismicity is of low magnitude and has unmeasurable effects on the production facilities which are designed for significantly higher ground accelerations. However, tremors propagating through the neighboring communities are a concern to residents.

The adopted mitigation for induced seismicity involves implementation of a program to monitoring horizontal and vertical displacement as follows:

- Before controlled mitigation of seismic activity can be implemented, a sustained monitoring program is needed to measure vertical and horizontal displacements in order to assess the seismic risks in the region. Further research about the dynamics and makeup of the reservoir is needed from production data, geophysical data, and well logs. Without thorough information, the long range effects of steam withdrawal and injection on the geothermal resource cannot be weighed against the benefits of controlling subsidence and seismic activity (FEIR Mitigation Measure #43).

This impact is considered unavoidable and not mitigated by measures that can be implemented by operators. Induced seismicity will continue to occur in association with geothermal

production. Though seismic events and magnitudes associated with geothermal extraction have heretofore been insignificant, this trend cannot be reliably predicted into the future.

The EIR evaluated several alternatives which could have the potential to reduce or eliminate the identified environmental impacts of ground subsidence. Of the alternatives considered, and identified previously, the No Project, Alternative Technology and Alternative Land Use Alternatives could lessen, but not eliminate the unavoidable impacts of induced seismicity at The Geysers. The impacts would be reduced by minimizing or eliminating the need for extraction of additional quantities of steam from the area. None of these alternatives allow the State Lands Commission to fulfill its obligations under the Geothermal Resources Act and are not considered feasible.

PHYSIOGRAPHY AND GEOLOGY: Cumulative Impacts - Resource Depletion

Impact: Cumulative developments may diminish the long-term viability of the geothermal resource. As existing operations have seen a decline in the steam resource, additional development including makeup wells, generically, increases the rate at which the available quantity of heat is extracted from the reservoir. It is not known at this time whether this level of development is actually significant over the expected 60 year life of the field, however, the impact is assumed to be a significant adverse impact.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; California Division of Oil and Gas; and California Regional Water Quality Control Board).

C) Specific economic, social and or other considerations make infeasible the mitigation measures or project alternatives identified in the Final EIR.

Facts Supporting the Finding:

Of importance from a cumulative standpoint is the overall decline in geothermal resource potential in The Geysers which is presently theorized to be accelerated due to lack of reinjection of sufficient quantities of fluids to offset depletion. The only measure available to mitigate this occurrence is to implement area-wide injection to conserve the resource (similar to FEIR Mitigation Measure No. 40). However, because of the lack of sufficient sources of water to support such an injection program and the need for such a program to be adopted industry-wide at The Geysers, this measure is considered to have low feasibility.

The EIR evaluated several alternatives which could have the potential to reduce or eliminate the identified cumulative environmental impacts of resource depletion. Of the alternatives considered, and identified previously under site-specific impacts, the No Project, Alternative Technology and Alternative Land Use Alternatives could lessen, but not eliminate the unavoidable impacts of induced seismicity at The Geysers. The impacts would be reduced by minimizing or eliminating the need for extraction of additional quantities of steam from the area. None of these alternatives allow the State Lands Commission to fulfill its obligations under the Geothermal Resources Act and are not considered feasible.

PHYSIOGRAPHY AND GEOLOGY: Cumulative Impacts - Induced Seismicity

Impact: Induced subsidence is considered a significant adverse cumulative impact, even though substantial impacts from this phenomenon have not occurred previously.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; and California Division of Oil and Gas).

C) Specific economic, social and or other considerations make infeasible the mitigation measures or project alternatives identified in the Final EIR.

Facts Supporting the Finding:

Geotechnical and seismic hazards present a risk to cumulative geothermal development. Seismic hazards include principally groundshaking, but could also involve fault rupture, seismically-induced liquefaction, and surface subsidence. Any of these potential hazards could have significant short-term adverse impact on geothermal operations, structures, pipelines, and power plant facilities. Of these effects, subsidence can be considered a significant adverse cumulative impact. This phenomenon has thus far not caused accumulated damage to the region because of the low level of developed uses of the area. However, subsidence is believed to be affected (slowed) by injection, and this measure would beneficially apply to cumulative development. Injection is expected to be increased by the operators over time to mitigate the ever increasing decline in steam productivity.

The mitigation measure discussed under site-specific impact is the only one available to mitigate the occurrence of induced seismicity FEIR Mitigation Measure No. 43). However, induced seismicity will continue to occur in association with geothermal production. Though seismic events and magnitudes associated with geothermal extraction have heretofore been insignificant, this trend cannot be reliably predicted into the future.

The EIR evaluated several alternatives which could have the potential to reduce or eliminate the identified environmental impacts of ground subsidence. Of the alternatives considered, and identified previously under site-specific impacts, the No Project, Alternative Technology and Alternative Land Use Alternatives could lessen, but not eliminate the unavoidable impacts of induced seismicity at The Geysers. The impacts would be reduced by minimizing or eliminating the need for extraction of additional quantities of steam from the area. None of these alternatives allow the State Lands Commission to fulfill its obligations under the Geothermal Resources Act and are not considered feasible.

SURFACE WATER HYDROLOGY: Non-Drilling Exploratory Activities

Impact: Short-term impacts caused by non-drilling exploratory activities involve the potential for a significant increase in sedimentation and erosion, including the increase in potential sediment load in nearby streams as a result of erosion from newly constructed roadways, drill pads, and other construction.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility and jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by such other agency or can and should be adopted by such other agency (Lake, Sonoma and Mendocino Counties and California Regional Water Quality Control Board).

Facts Supporting Finding:

Non-Drilling Exploratory activities are, by their nature, very focused and localized activities, result in minimal ground disturbance and/or road building, and consequently pose only a minor threat to the surface water or groundwater. The effects of these activities can be mitigated to insignificance through the following mitigation measures:

- The impacts on the surface waters can be reduced or eliminated by proper planning and siting. All available mapping, aerial photography, and available geotechnical reports should be reviewed prior to any exploration, drilling, or construction (FEIR Mitigation Measure #1).

- Plans of exploration shall detail methods to prevent erosion into creeks and streams (FEIR Mitigation Measure #2).

SURFACE WATER HYDROLOGY: Exploratory Drilling

Impact: Exploratory drilling will have significant adverse impact on surface as a result of potential for increased sediment load in streams due to newly constructed roadways, drill pads, and other construction.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility and jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by such other agency or can and should be adopted by such other agency (Lake, Sonoma and Mendocino Counties; and California Regional Water Quality Control Board).

Facts Supporting Finding:

Construction activities such as building pads, constructing road alignments, building sumps, and general drilling operations will all cause impacts that will be more short-term in nature rather than permanent. It should be pointed out that there are many site-specific impacts that cannot be included in this discussion due the lack of details as to specific locations for drill pads and operational facilities.

Mitigation measures requiring erosion and sedimentation control have been adopted to mitigate the impact as follows:

- The mitigation measures to reduce erosion and sedimentation for pad construction and design are as follows (FEIR Mitigation Measure #3):
  - During construction, cut and fill areas should be dammed with hay bales to prevent transport of sediment from construction site.
  - Pads shall be compacted to a minimum of 90 percent relative compaction.
  - Filled slope banks should not exceed a gradient of 1.5:1. Toes of fills should be stabilized with rock and gravel or keyed into stable soil.
  - Hill storage of spoilage should be avoided whenever possible.
  - Fill and cut slopes should be seeded, mulched, and fertilized as soon as possible.
- The additional mitigation measures suggested for construction of road alignments are in general the same as those for pad construction plus the following (FEIR Mitigation Measure #4):
  - Keep road width to a minimum.
  - On hillsides the road surface should slope into the hillside.
  - Culverts, drainage ditches and adequate energy dissipaters at transition to natural drainage channels should be installed as necessary.

Upon implementation of the mitigation measure described above, the significant adverse impacts will be reduced to levels considered acceptable and therefore insignificant.

SURFACE WATER HYDROLOGY: Exploratory Drilling

Impact: Exploratory drilling will have significant adverse impact on surface from as a result of potential for spillage of drilling fluids and/or fluids discharged from blowouts.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility and jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by such other agency or can and should be adopted by such other agency (Lake, Sonoma and Mendocino Counties; California Division of Oil and Gas; and California Regional Water Quality Control Board).

Facts Supporting Finding:

If oil, grease, or drilling fluid spills occur during the drilling and/or construction operations, these fluids can migrate down slope and into the water courses. The greatest concern is of course for the spillage of drilling fluids during drilling operations. Uncontrolled blowouts of drilling fluids or formation waters can result in overtopping the sumps and loss of fluids into the water courses. Additionally, ground compaction will result from the stripping of vegetation during the construction of drilling and operations pads. This compaction will cause a greater runoff than that normally encountered during rainfall on an area with vegetation and normal soil aeration.

Drilling wastes and test fluids could be produced in fairly large quantities during exploratory well drilling. The accidental deposition of drilling fluids into nearby waters could create significant adverse water quality conditions deleterious to most aquatic organisms. Increased turbidity would reduce visual feeding activity and increase biological and chemical oxygen demand.

The following mitigation measures requiring proper design of sumps, dikes, and berms, as well as preparation of contingency plans for emergency spills have been adopted as follows:

o During drilling operations, in addition to the above listed measures, the following additional measures should be taken (FEIR Mitigation Measures #5):

- Sumps should always be maintained with at least 3 feet of freeboard to accommodate blowouts, excess formation fluids, or heavy rains.

- Proper berms and dikes should be strategically placed to guard against the accidental release of oils, grease, and cleaning solvents during drilling operations.
- Lessee/operator shall prepare a viable contingency plan for spills and emergency pumping of the sump in the event of a heavy, unexpected rainfall or if excessive geothermal fluids are encountered. The plan shall show who is responsible and what equipment and manpower is available to respond to such an emergency (FEIR Mitigation Measure #6).
- The primary protection of the groundwater is accomplished by proper lining of all sumps and monitoring sumps on a monthly basis (FEIR Mitigation Measure #7).
- Everyone on the drilling pad or facility pad must be constantly aware of any leaks, spills, or disposal of any liquid wastes directly onto the ground (FEIR Mitigation Measure # 8).

Upon implementation of the mitigation measure described above, the significant adverse impacts will be reduced to levels considered acceptable and therefore insignificant.

SURFACE WATER HYDROLOGY: Lease Development

Impact: The significant impacts to surface waters resulting from full scale development of the resources are the same as those resulting from exploratory drilling except that the magnitude of potential construction projects is much greater which increases the potential or frequency of impacts.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility and jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by such other agency or can and should be adopted by such other agency (Lake, Sonoma and Mendocino Counties; California Division of Oil and Gas; and California Regional Water Quality Control Board).

Facts Supporting Finding:

The development of the lease into production status may involve one or more of the following: drilling additional wells, building a generation plant, constructing pipelines, feeder transmission lines, and providing required access. Measures to protect surface waters which require consideration of flood flows and proper setback from active streams have been adopted as follows:

o All measures listed for Exploratory Drilling above also apply to field development drilling (FEIR Mitigation Measure #9).

- Roads and pipelines crossing riparian areas shall be minimum safe widths and constructed for maximum erosion control (FEIR Mitigation Measure #10).

- Proposed development projects that involve riparian areas, wetlands, and wet meadows subject to possible local flooding or seasonal inundation shall include appropriate setbacks from such wet areas (FEIR Mitigation Measure #11).

- Floodplain management practice shall be applied in all designated 100-year floodplains (FEIR Mitigation Measure #12).

- The development of generating technologies that have the potential for using less water or increasing the use of recycled water and wastewater shall be encouraged (FEIR Mitigation Measure #13).

- The foundation design for the power plant facilities should take into account the potential for high seasonal groundwater levels (FEIR Mitigation Measure #14).

- It is advisable to monitor the spring(s) in proximity to a thermal gradient boring during and for some period following completion of the boring. Such monitoring shall be accomplished by a certified groundwater hydrologist (FEIR Mitigation Measure #15).

- In order to preserve the hydrologic integrity of the project area, the applicant shall obtain by right or purchase all water used in the drilling process or dust control. The equipment service and fuel transfer area and the area occupied by the drilling rig shall drain into the sump (FEIR Mitigation Measure #16).

Upon implementation of the mitigation measure described above, the significant adverse impacts will be reduced to levels considered acceptable and therefore insignificant.

SURFACE WATER HYDROLOGY: Operation and Maintenance

Impact: The potential of contamination of surface water via liquid wastes is a potential significant adverse impact.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility and jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by such other agency or can and should be adopted by such other agency (Lake, Sonoma and Mendocino Counties; and California Regional Water Quality Control Board).

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Facts Supporting Finding:

Deleterious liquid wastes occur as formation liquids produced during utilization of the steam and/or condensate from well heads and valve locations. Constituents found in geothermal condensate around valves and wellheads at other locations may show high concentrations of boron, arsenic, and mercury. While most liquids produced are expected to be re-injected into the formation, there is always the potential for the liquids to be released into the surface waters of the area.

The extent of degradation of natural waters resulting from accidental spills depends on the quantity and composition of the initial spill, pH of spilled materials, the intensity and duration any rainfall which may occur during the spill, the flow and quality of receiving waters which determine the dilution factor, and chemical reactions influencing the ultimate deposition of waste materials. An increase in salinity could result in toxic responses from organisms in the waterway. Trace metals and other minor components could accumulate in food chains, causing sublethal and/or lethal effects, depending upon concentrations and component.

The following measures requiring proper waste disposal are proposed to minimize this potential adverse impact:

- All waste, whether liquid, solid, or gaseous must be disposed of in compliance with existing federal, state and county regulations. No waste shall be allowed to enter any streams, creeks or other body of water. Disposal of well effluents must take into account effects on surface and subsurface waters, plants, fish, and wildlife and their habitats, atmosphere, or any other effects which may cause or contribute to pollution (FEIR Mitigation Measure # 17).

- In no event shall the contents of a pit, sump, or test pond be allowed to : a) contaminate streams, artificial canals or waterways, groundwaters, lakes or rivers; b) adversely affect the environment, persons, plants, fish and wildlife and their habitats; or c) damage the aesthetic values of the property or adjacent properties (FEIR Mitigation Measure # 18).

- During suspension of operation, sumps and test ponds are to be filled and covered and the premises restored to a near natural state as prescribed by the agencies of jurisdiction (FEIR Mitigation Measure # 19).

- Culverts and ditches shall be regularly cleaned and maintained to reduce the possibility of overflow and resultant erosion and siltation (FEIR Mitigation Measure # 20).

- Adequate energy dissipaters shall be installed at transitions from culverts and drainage ditches into natural water courses to prevent erosion of the natural water course (FEIR Mitigation Measure #20a).

- As an added precaution, a vacuum truck should be available at all times to remove spilled condensate, or to remove excessive waste water from the condensate pond and drill sump in case heavy rains cause overflow (FEIR Mitigation Measure # 21).

- o Drainage into natural waterways should not increase water head to the point of unnatural channel abrasion, nor carry excessive siltation which might adversely impact water quality (FEIR Mitigation Measure # 22).

Upon implementation of the mitigation measure described above, the significant adverse impacts will be reduced to levels considered acceptable and therefore insignificant.

SURFACE WATER HYDROLOGY: Operation and Maintenance

Impact: A potentially significant adverse impact is the over-use of the surface waters in the geothermal operations. Additionally, the impact of development of water resources in area watersheds is seen as a significant adverse impact due to the extremely limited nature of the resource.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility and jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by such other agency or can and should be adopted by such other agency (Lake, Sonoma and Mendocino Counties; County Air Pollution Control Districts; and California Regional Water Quality Control Board).

Facts Supporting Finding:

While most operators indicate that they intend to use condensate waters for routine plant operations, some operators in the area are using large volumes of water from the surface streams for general operations and for additional injection to create a better return potential of steam. Since the area does not have a large watershed and high rainfall, water resources are very limited. The development of water resources on area streams represent a significant adverse impact.

Mitigation measures implementing surface water protection and monitoring programs have been adopted as follows:

- o Encourage use of alternative sources of water for injection which are both technically feasible and environmentally acceptable (FEIR Mitigation Measure # 23).

- o Water resources are to be protected for existing and future beneficial uses, including for residential, commercial, and agricultural needs. Water rights are to be protected to accommodate projected long-term water needs. Geothermal water use and reservoir management practices shall be conducted in a comprehensive manner which do not adversely affect existing beneficial uses (FEIR Mitigation Measure # 24).

- The lessee/operator should compile a list of residents who obtain water from the creeks involved in each project. These residents should be promptly notified in the event of any spill or discharge which would impact water quality and which requires notification of the Regional Water Quality Control Board. Addresses and phone numbers of these residents should be part of a spill contingency plan (FEIR Mitigation Measure # 25).

- Water quality monitoring programs shall begin at least 1 month prior to the onset of pad construction if the water course is subject to an ongoing sampling program (FEIR Mitigation Measure # 26).

- If the lessee/operator elects to conduct or participate in a larger and more comprehensive water quality program, such a proposal must be submitted to and accepted by the County Planning Department and begun prior to the commencement of construction activities (FEIR Mitigation Measure # 27).

- Information concerning chemical and isotopic makeup of geothermal fluids encountered in the course of development of any well on a pad located within 3,960 feet of a natural thermal spring developed and maintained for current use, shall be provided to the county for use in determining the relationship, if any, between the geothermal resource and the natural spring waters. Such information shall be considered confidential between parties with a "need to know" and shall not be public knowledge (FEIR Mitigation Measure # 28).

Upon implementation of the mitigation measure described above, the significant adverse impacts will be reduced to levels considered acceptable and therefore insignificant.

SURFACE WATER HYDROLOGY: Abandonment

Impact: Impacts to surface waters are potentially significant for the short-term period and are similar in nature to the impacts for the exploratory wells, particularly soil erosion and sedimentation impacts.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility and jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by such other agency or can and should be adopted by such other agency (Lake, Sonoma and Mendocino Counties; County Air Pollution Control Districts; California Division of Oil and Gas; California Regional Water Quality Control Board).

Facts Supporting Finding:

When the project has reached its useful life, the facilities, the pipelines and the wells must be abandoned and removed, causing impacts very similar to that of construction of well pads and roads. The impacts will be transitory in nature and very short-lived. Measures to mitigate such impact, including proper abandonment according to agency regulations, are as follows:

- Upon completion of any phase of the project, the site shall be cleared of all unnecessary materials and restored insofar as practical, in accordance with the requirements of the California Division of Oil and Gas, California Regional Water Quality Control Board, SLC, and county use permit conditions (FEIR Mitigation Measure # 29).

- When no longer needed, sumps and test ponds are to be filled and covered and the premises restored to a near natural state as prescribed by the agencies of jurisdiction (FEIR Mitigation Measure # 30).

- Within 15 days of the removal of drilling equipment, sump fluids (both mud and supernatant liquids) shall be chemically analyzed for hazardous materials, biologically sensitive materials, heavy metals, and acids, unless waived in writing by the County Planning Director (FEIR Mitigation Measure # 31).

Upon implementation of the mitigation measure described above, the significant adverse impacts will be reduced to levels considered acceptable and therefore insignificant.

GROUNDWATER HYDROLOGY: Exploratory and Operations Phases

Impact: There is potential for significant impact to the limited ground water resources during the drilling and operations phases as a result of, 1) accidental seepage of drilling fluids and other stored fluids through the liners of the sumps on the drilling pads, 2) accidental seepage into the ground of oils, grease, and/or cleaning solvents, and 3) migration of formation fluids up and into the groundwater zones as a result of faulty cement jobs and completion practices.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility and jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by such other agency or can and should be adopted by such other agency (Lake, Sonoma and Mendocino Counties; California Division of Oil and Gas; and California Regional Water Quality Control Board).

Facts Supporting Finding:

Groundwater occurrence and usage in the area is minimal. In general, the resource is very limited. The migration of drilling fluids into surrounding groundwater sources would have an effect quite similar to that caused by the drilling of regular domestic water wells in the area. Most of the wells are drilled using drilling muds and are developed into potable water sources. Should the drilling fluids of the geothermal test, or production wells be introduced accidentally into the groundwater, the principal problem created would be a short-term increase in finely disseminated sediment, assuming the drilling muds used were a biodegradable, non-toxic type mud. Mitigation in the form of sump lining and monitoring has been adopted as follows:

o The primary protection of the groundwater is to be accomplished by proper lining of all sumps and monitoring same on a monthly basis (FEIR Mitigation Measures # 32).

Upon implementation of the mitigation measure described above, the significant adverse impacts will be reduced to levels considered acceptable and therefore insignificant.

SURFACE AND GROUNDWATER HYDROLOGY: Cumulative Impacts

Impact: The potential for significant, hydrologic impacts from increased sedimentation is high for a short duration during and shortly after construction of future geothermal development sites.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility and jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by such other agency or can and should be adopted by such other agency (Lake, Sonoma and Mendocino Counties; County Air Pollution Control Districts; California Division of Oil and Gas; and California Regional Water Quality Control Board).

Facts Supporting Finding:

Potential sources of surface water degradation include increased sedimentation from the clearing and grading of land for access roads, drill pads, and power facilities for the cumulative development projects. However, these significant cumulative impacts can be mitigated by designing and constructing settling basins for the localized man-made drainage courses which drain into the natural watercourses and by implementing the measures described above for site-specific impacts on a case-by-case basis. No additional mitigation measures are necessary to address cumulative surface water impacts from sedimentation.

SURFACE AND GROUNDWATER HYDROLOGY: Cumulative Impacts

Impact: With cumulative developments, the probability of accidental spills or discharge of toxins into the environment by release with steam will incrementally increase and is potentially significant. These impacts will add to the subtle long-term water quality impacts experienced in the area which are attributed to geothermal development.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility and jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by such other agency or can and should be adopted by such other agency (Lake, Sonoma and Mendocino Counties; California Division of Oil and Gas; and California Regional Water Quality Control Board).

Facts Supporting Finding:

With cumulative projects, potential spills of hazardous waste materials, and the condensation of vented steam which contains toxic constituents such as H_2S and ammonia could increase. Mitigation to prevent such occurrences includes the development and implementation of operational plans for the collection, handling, and disposal of these materials within the established framework of the existing regulatory agencies. Such measures have been discussed under site specific impacts and are applicable to the cumulative impact. Additionally, monitoring of water quality has been done at times at the Geysers and presents a beneficial way to quantify the incremental water quality effects which may occur. It is proposed to expand the monitoring program to the proposed project areas as follows:

- Cumulative impacts relative to incremental water quality effects are monitored on an area-wide basis. Applicants in proposed project areas shall participate in the area-wide monitoring programs (FEIR Mitigation Measure #33).

Upon implementation of the mitigation measure described above, the significant adverse impacts will be reduced to levels considered acceptable and therefore insignificant.

SURFACE AND GROUNDWATER HYDROLOGY: Cumulative Impacts

Impact: Any significant diversion of surface water for reservoir injection will significantly diminish water quality and aquatic habitats, as well as significantly reduce the amount of water available for domestic, agricultural, and other needs.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility and jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by such other agency or can and should be adopted by such other agency (Lake, Sonoma and Mendocino Counties; California Division of Oil and Gas; and California Regional Water Quality Control Board).

C) Specific economic, social and or other considerations make infeasible the mitigation measures or project alternatives identified in the Final EIR.

Facts Supporting Finding:

A potential long-term water quality and supply impact involves use of surface water sources for reservoir injection. The implementation of an area-wide reservoir injection program to conserve the geothermal resource has been discussed as a means of extending the life of The Geysers steam resource. One source of water for the reinjection program would be the development of local surface and/or groundwater sources.

A possible alternative to the use of surface water runoff and/or local groundwater to augment injection is the use of effluent from publically-owned treatment works (POTW). To provide effluent to The Geysers would require a piping and pumping system from the POTW to the power plants. The plants would then utilize the existing distribution system to the injection wells. Upon review of the amount of effluent that could conceivably be made available, there may be sufficient quantity optimize energy extraction. As the steam field ages, a secondary source of injectate will be essential to maintain a certain level of steam output. In order to mitigate an adverse cumulative impact on surface water supply, a reservoir injection program is proposed as follows:

- The implementation of an area-wide reservoir injection program to conserve the geothermal resource as discussed under cumulative geologic mitigation measures would require a corresponding program to develop local surface and/or groundwater sources to support reinjection. While such a program could provide some disposable water supplies, coupled with advances in technology which produce greater steam efficiency and greater condensate for reinjection, the amount of freshwater available for this use is limited. Rather than developing water resources on a case-by-case basis, an industry effort should be made to assess reinjection needs on reservoir basis, and to develop comprehensive measures to meet reinjection needs.

The mitigation measures described above will reduce the significant adverse impacts to levels considered acceptable and therefore insignificant. However, before any resource conservation/injection program could be implemented, a program for development of sufficient fluid injection sources needs to be implemented. The uncertainties of the availability of sufficient fluids is a major factor affecting conservation of the steam resource at The Geysers. Due to these

uncertainties, the potential demand for surface water sources with the increase in geothermal production remains a significant unmitigated impact.

The EIR evaluated several alternatives which could have the potential to reduce or eliminate the identified environmental impacts.

No Project Alternative

Implementation of the No Project Alternative would mean that the State Lands Commission would not offer any of the lands within the study area for leasing for geothermal resources. These resources would remain undeveloped for the foreseeable future. From the standpoint of the unavoidable adverse impact on surface and groundwater resources, adoption of this alternative would reduce but not eliminate the impact. Impetus to develop surface water sources for injection presently exists with current operations, and will occur with future operations.

Leasing Portions of the Project Areas

This alternative involves leasing one or two of the three project areas identified for prospective leasing. The reasons for omitting any particular leasing area could be numerous; however, this analysis assumes that the reason would be lessen demand for reinjection fluids. While this alternative could perhaps accomplish that purpose, it would not have any effect of reducing demand for reinjectate relative to existing operations.

Prohibiting Construction of Power Plants

This alternative would allow construction of steam fields in the area, but not development of new power plants. Since this alternative does eliminate such activity, the unavoidable adverse impacts of surface and groundwater resources could still occur.

Alternative Land Uses

This alternative is based on the assumption that the State Lands Commission could encourage alternative land uses, other than geothermal uses, to be established on the leasehold areas. The State Lands Commission is limited in its ability to establish or encourage land uses beyond its jurisdiction to lease lands for resource and mineral development. Local land use approvals for any use subsequent to leasing are under the purview of the local county governments with jurisdiction. The state does own the lands on Cobb Mountain within the designated lease area and would have some land use authority there. Uses other than geothermal development may or may not involve demand for surface water and groundwater resources.

Alternative Technology

This alternative assumes that alternative technologies could be implemented to exploit the geothermal resources of the project areas. The need for implementation of alternative technologies has several purposes, including the reduction in the physical environmental impacts of more traditional geothermal development, and the extension of the life of The Geysers steam

field through conservation and more efficient use of the resources. However, this alternative does not eliminate the need for drilling and extraction of geothermal resources, but by better use of thermal conversion technology, it is possible to reinject a larger portion of the fluids originally extracted.

In conclusion, the No Project, Alternative Technology and Alternative Land Use Alternatives could lessen, but not eliminate the unavoidable impacts on demand for surface and groundwater supplies. None of these alternatives allow the State Lands Commission to fulfill its obligations under the Geothermal Resources Act and are not considered feasible, not withstanding efforts by State Lands Commission to encourage geothermal operators to implement resource conservation measures at The Geysers.

BIOLOGICAL RESOURCES: Non-Drilling Exploration Activities - Vegetation

Impact: Trampling and removal of vegetation during exploration may be potentially significant if rare or sensitive plants are impacted.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

Facts Supporting the Finding:

Surface and shallow geochemical and geophysical testing will require the removal of vegetation to gain vehicular access to some test locations. Workers may also cause localized trampling of vegetation in the test areas. Though these impacts would not be significant in terms of a substantial vegetation disturbance, they could be potentially significant if suitable habitat for rare or sensitive plant species is affected.

The potential for significant adverse impacts to rare and sensitive plant species will be reduced to insignificant levels through implementation of measures requiring site-specific rare plant surveys as follows:

- A site-specific plant survey and rare plant survey shall be conducted by a qualified biologist in accordance with guidelines developed by the California Native Plant Society as recommended by the California Department of Fish and Game (FEIR Mitigation Measure #1).

BIOLOGICAL RESOURCES: Non-Drilling Exploration Activities - Wildlife

Impact: Access road construction could negatively impact active large mammal (such as coyote) den sites.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

Facts Supporting the Finding:

Due to the minor amount of habitat alteration and relatively short duration of exploration activities in any given area, overall wildlife impacts would be minimal during the exploration phase of the project. However, construction of new access roads could impact any active large mammal dens located along the routes.

Implementation of the following mitigation measure requiring survey for carnivore dens will reduce adverse impacts to insignificant levels:

- o A survey shall be conducted by a qualified wildlife biologist to assure no active carnivore dens are present. If an occupied den is found, appropriate procedures shall be taken to assure the safety of occupants. Such actions may include relocation of the occupants by a qualified wildlife biologist (FEIR Mitigation Measure #2).

BIOLOGICAL RESOURCES: Exploratory Drilling - Vegetation

Impact: Exploratory drilling activities could potentially remove or damage rare or sensitive plant populations.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies. (Lake, Sonoma and Mendocino Counties).

Facts Supporting the Finding:

Exploratory drilling will require brush clearing for road construction, road widening, clearing of drilling pad sites, and other exploration activities. These operations could inadvertently damage or remove rare or sensitive plant species.

Rare or sensitive plants could also be damaged in the event of an accidental spillage of hot liquids. (Mitigation measures to prevent such spills are discussed in all phases of the surface water and groundwater hydrology sections of these Findings.)

The potential for significant adverse impacts to sensitive plant life resulting from exploratory activities will be reduced to insignificant levels through implementation of measures to avoid sensitive plant populations as follows:

- o The construction period should avoid seasons of the year in which erosion potential is high (generally November through May) (FEIR Mitigation Measure #3).

- o Removal of or injury to sensitive plant species shall be avoided. To minimize the possibility of accidental damage to sensitive plant populations by machinery or human activity, locations of such populations should be flagged or fenced prior to exploration or construction. During construction, periodic monitoring by a qualified botanist shall be conducted in order to ensure the integrity of the population (FEIR Mitigation Measure #4).

- o If removal or injury to a sensitive plant population cannot be avoided, partial mitigation is possible through the development and implementation of a management plan for each

species affected, prior to such removal or injury. Such a plan shall include, at minimum: 1) research into the reproductive ecology of the species, so as to evaluate the potential success of various management options (e.g., transplantation, seeding); 2) assessment of the surrounding habitat in terms of its potential to support the species; 3) research into the genetics of the species, sufficient to determine the minimum population size required for long-term existence of the population; 4) monitoring of the management area for three years or more, depending on the life span of the plant and the success of management efforts (FEIR Mitigation Measure #5).

- Stepped benches shall be used where appropriate and as considered necessary by a revegetation specialist (FEIR Mitigation Measure #6).

- Woody vegetation, stumps, and brush should not be buried on site but preferably chipped and spread as mulch over project cut and fill or incinerated in a safe manner (FEIR Mitigation Measure #7).

- Mechanical stabilization without reseeding should be permitted on areas where construction is not complete or scheduled for continuation the following year. Mechanical stabilization is defined as measures to prevent or reduce to small amounts soil loss over the rainy season (FEIR Mitigation Measure #8).

- Road construction, exploratory drilling, and power plant development in riparian areas shall be avoided (FEIR Mitigation Measure #9).

BIOLOGICAL RESOURCES: Exploratory Drilling - Wildlife

Impact: Modification of the existing wildlife habitat could result in the significant loss of den sites for larger carnivores (such as coyotes).

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies. (Lake, Sonoma and Mendocino Counties).

Facts Supporting the Finding:

Exploratory drilling will result in considerable local modification of wildlife habitat. Construction of the drilling pad and sump will result in 100 percent removal of native vegetation in areas encompassing approximately 2.5 acres per pad, that would otherwise serve as food, shelter, and nesting sites for wildlife. This impact will be greatest in Project Area No. 3, where drill pad construction will likely require the removal of portions of yellow pine forest.

Important den sites for larger carnivores including gray fox and coyote may be lost constituting a significant adverse impact.

Auditory and visual disturbance during exploration drilling will modify wildlife behavior in the vicinity. Negative impacts could include a reduction in foraging success, predator avoidance, and courtship. Wildlife response to ongoing disturbances is highly variable. Some species (such as deer and coyotes) habituate quickly, while more secretive species (such as gray fox and bobcat) do not, and may be displaced. These impacts are considered temporary.

Implementation of the following mitigation measures requiring survey for carnivore dens and erecting fences avoiding wildlife corridors will reduce adverse wildlife impacts to insignificant levels:

- As with non-drilling exploration, a survey shall be conducted by a qualified wildlife biologist to determine if active carnivore dens are present prior to exploration activity. Fence lines shall be positioned as to not block movement corridors of grazing animals or wildlife (FEIR Mitigation Measure #10).

BIOLOGICAL RESOURCES: Exploratory Drilling - Aquatic Resources

Impact: Exploratory drilling could increase sedimentation rates, and accidentally spilled toxic materials could wash into streams.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; Regional Water Quality Control Board).

Facts Supporting the Finding:

Access road construction and/or widening, clearing of the drill pad sites, disposal of soils, and construction of the drilling pad sumps would have a similar but greater potential to cause erosion and increase sedimentation than the non-drilling exploratory phase of the project. As discussed in the previous section, excess sedimentation could have adverse impacts on fish and invertebrate populations.

There is also a chance for potentially toxic materials to be spilled and eventually flow or be washed into streams during exploratory drilling. A spill of drilling fluid could have acute adverse impacts on aquatic life. An uncontrolled blowout could also expel drilling fluids or formation waters could also result in these fluids entering into streams.

The potentially significant adverse impacts resulting from increased sedimentation into streams can be reduced to insignificant levels by implementing measures to prevent such runoff from reaching surface waters as follows:

- o Cut and fill areas shall be dammed with sandbags during construction to prevent transport of sediment from the construction site (FEIR Mitigation Measure #11).

- o Proper grading measures shall be taken to minimize the amount of soil runoff entering natural drainages. Sedimentation rates and turbidity levels should be monitored prior to and during all phases of drilling exploration and facility construction (FEIR Mitigation Measure #12).

BIOLOGICAL RESOURCES: Full Field Development - Vegetation

Impact: Removal of a significant amount of vegetation for field development and power plant construction and or impact from accidental spill is a potentially significant adverse impact.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; Regional Water Quality Control Board).

Facts Supporting the Finding:

The removal of substantial acreage of natural vegetation communities for power plant construction and construction of new roadways is considered a significant impact, and highly significant if such removal occurred in a sensitive habitat such as serpentine grassland or chaparral, riparian community, or freshwater wetland. Removal of vegetation for power transmission facilities, and possible injury of adjacent vegetation due to erosion from unvegetated soils, would result in potentially significant impacts. The extent of these impacts would depend on the number of transmission towers and other facilities required by individual power plants, and on whether or not such facilities were located in a sensitive habitat. Mitigation measures requiring revegetation plans and avoidance of sensitive resources have been adopted to reduce field development impacts to insignificant levels as follows:

- o All mitigation measures applicable to Exploratory Drilling - Vegetation shall also apply to Field Development (FEIR Mitigation Measure #13).

- o A revegetation and landscaping plan shall be developed which utilizes native plant species of the area. Source material for revegetation should be local in order to minimize disruption of the genetic structure of adjacent, undisturbed plant populations. The plan should include provisions for monitoring and care of the vegetation until the plants are established, so as to ensure that the revegetation is successful (FEIR Mitigation Measure #14).

- o Revegetation of the power plant site shall be accomplished in two phases. First, the site shall be hydroseeded following application of straw. Second, woody species will be planted one year following construction (FEIR Mitigation Measure #15).

- o Topsoil shall be stockpiled for later respreading over the disturbed areas prior to revegetating as recommended by a revegetation specialist (FEIR Mitigation Measure #16).

- o In areas requiring removal of vegetation but no grading, root crowns shall be left intact so as to retard soil erosion (FEIR Mitigation Measure #17).

- o Where technically possible, roadways shall be aligned with existing dirt roads and jeep trails to decrease habitat disturbance. Portions of old jeep trails and dirt roads that closely parallel newly constructed roads, and are to be abandoned, shall be scarified and seeded to reestablish vegetation cover (FEIR Mitigation Measure #18).

- o Tree removal shall be minimized, particularly larger oaks. When large oaks are cut down; they should be trimmed (leaving major side branches), nest holes should be bored (various diameters from 1 to 6 inches), and the trees mounted upright in chaparral area to function as hard snags. Selection of trees and precise placement of artificial snags should be determined by on-site consultation with a qualified wildlife specialist (FEIR Mitigation Measure #19).

- o Jute netting or hydromulch shall be installed on cut and fill slopes. Longer slopes shall be terraced. When disposing of drainage on a long fill, an apron or discharge pipe will be placed at the bottom of the fill to avoid gullying. Energy dissipators shall be installed at the point of discharge (FEIR Mitigation Measure #20).

- o To consolidate the soil and provide forage at chaparral and open woodland sites, such areas shall be seeded with forage grasses and other suitable native herbs (FEIR Mitigation Measure #21).

BIOLOGICAL RESOURCES: Full Field Development - Wildlife

Impact: Considerable local modification of wildlife habitat will result, particularly at power plant sites.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR (Lake, Sonoma and Mendocino Counties; California Department of Fish and Game).

Facts Supporting the Finding:

Wildlife impacts associated with full development of the lease properties are similar to those described for the non-drilling exploration, and drilling exploration phases of the project, but on a substantially greater scale, involving approximately 50 to 100 ha (110 to 220 ac) per power plant site. The extent of the impacts is dependent on the specific location of development relative to key wildlife resources such as perennial drainages. Fossorial mammals and reptiles will be displaced or killed with the full-scale construction of the plant facilities, and den sites for larger carnivores will be removed. Loss of occupied maternal dens will have the greatest impact on the carnivore populations.

Implementation of the following mitigation measure requiring avoidance of critical habitat and consideration of threatened and endangered species will reduce adverse wildlife impacts during the full field development phase to insignificant levels:

- All wildlife mitigation measures applicable to Exploratory Drilling shall also apply to Field Development (FEIR Mitigation Measure #22).

- New high voltage electrical transmission lines shall not be located in a manner that may potentially harm the critical habitat of any rare, endangered, threatened or protected animal or plant species. Species that are under consideration for the inclusion in either the state or federal rare and endangered species lists are included in this policy (FEIR Mitigation Measure #23).

- Large snags and old trees with cavities shall be preserved to provide wildlife habitat (FEIR Mitigation Measure #24).

BIOLOGICAL RESOURCES: Full Field Development - Aquatic Resources

Impact: Exploratory drilling could increase sedimentation rates, and accidentally spilled toxic materials could wash into streams.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR (Lake, Sonoma and Mendocino Counties; California Regional Water Quality Control Board).

Facts Supporting the Finding:

The impacts of development would be similar to those of exploratory drilling except that the much more extensive construction and drilling of a greater number of wells might increase the potential and the scale of impacts. Vegetation removal and road and facilities construction for geothermal development within the project areas, again, would have the potential to increase sedimentation in streams resulting in possible sedimentation impacts on aquatic communities. Spills or accidents involving drilling fluids, formation waters, oil and grease or other materials might introduce toxic chemicals to the streams and cause lethal or sublethal effects on aquatic organisms.

Implementation of the following mitigation measure establishing a streamside conservation area will reduce adverse aquatic resource impacts during the full field development phase to insignificant levels:

o A permanent streamside conservation area of 100 feet, from the top of the bank, shall be established along Squaw Creek and other designated steelhead resource streams. On discretionary permits subject to environmental review, the conservation area may be expanded to include all riparian vegetation and a buffer zone of 10 feet from the outside drip line of the riparian canopy. However, in no instance shall the corridor, inclusive of the buffer zone, exceed 200 feet from the top of the bank (FEIR Mitigation Measure #25).

BIOLOGICAL RESOURCES: Operation and Maintenance - Vegetation

Impact: As in earlier phases of the project, there is a potential for a significant adverse impacts to vegetation resulting from steam emissions, and from accidental spills.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies.(Lake, Sonoma and Mendocino Counties; California Regional Water Quality Control Board).

Facts Supporting the Finding:

Other than continued potential for impacts from toxic constituents of the steam emissions to impact nearby vegetation, and the potential for an accidental spill of material which is toxic to plant life, operation and maintenance of the steam field and associated facilities is not expected to result in impacts beyond those described for earlier phases of the project.

Previous mitigation for aquatic impacts are applicable. Implementation of the following mitigation measure will reduce adverse vegetation impacts during the operation and maintenance phase of the project to insignificant levels:

- Monitoring of the health of vegetation which is potentially impacted by steam emissions shall be conducted for proposed facilities. The results of this study shall be incorporated into future site-specific environmental assessments (FEIR Mitigation Measure #26).

- Appropriate substrate, (i.e. soil), should be present and properly prepared for a seed bed for revegetation. Application of seed should occur at optimum times of the year for rapid germination and vigorous growth. Applications of surface stabilizing mulches should be applied before or immediately after seeding to control sheet erosion. Long-term establishment of vegetation should have precedence over short-term expediency; however, the first objective should be paramount (FEIR Mitigation Measure #27).

- The entire revegetation program shall be assessed during the spring following initial planting and an evaluation statement prepared by the revegetation specialist. If the original effort is deemed unsuccessful by the County Planning Department or State Land Commission, additional revegetation will be required before the next fall (FEIR Mitigation Measure #28).

- If any well is bled to the atmosphere while awaiting connection to a power plant, H^2S emissions will be abated if potential for substantial damage to vegetation exists (FEIR Mitigation Measure #29).

- Vegetation beyond the construction perimeter should not be disturbed. The clearing limits for pads and roads should be specified in the plans and specifications to be submitted for approval to the County Planning Department of jurisdiction and may not be changed without Planning Director approval. (Depending upon permit requirements, other agencies such as California Department of Fish and Game may need to oppose such plans) (FEIR Mitigation Measure #30).

- Vegetation within fall-out range of bleeding wells should be assessed for damage or growth impedance by a qualified person annually and a report submitted to the County Planning Director of jurisdiction. If damage to the ecosystem is present, mitigation measures should be enacted according to direction from the Planning Department and ultimately State Lands Commission (FEIR Mitigation Measure #31).

- Wildlife habitat shall be periodically studied and evaluated to monitor potential impacts from geothermal development (FEIR Mitigation Measure #32).

- Some downed logs should be left around the perimeter of pads and roads to provide den sites, escape, and thermal cover, as well as perching and courtship sites for wildlife. As they decay, downed logs also return valuable nutrients to the soil (FEIR Mitigation Measure #33).

BIOLOGICAL RESOURCES: Operation and Maintenance - Wildlife

Impact: Additional impact on wildlife species is not expected during this phase of development. However, barriers to reestablishment of wildlife could result in lost opportunities for rehabitation.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies.(Lake, Sonoma and Mendocino Counties).

Facts Supporting the Finding:

The continued operation of the steam plant facilities will not impact additional habitat beyond that lost in the development. Some species, initially displaced by construction may return to the vicinity of power plants. In order to encourage this monitor and enhance this return, the following measures have been adopted:

- Wildlife habitat shall be periodically studied and evaluated to monitor potential impacts from geothermal development (FEIR Mitigation Measure #32).

- Some downed logs should be left around the perimeter of pads and roads to provide den sites, escape, and thermal cover, as well as perching and courtship sites for wildlife. As they decay, downed logs also return valuable nutrients to the soil (FEIR Mitigation Measure #33).

BIOLOGICAL RESOURCES: Abandonment

Impact: Improper well abandonment could result in contamination and mortality of surrounding vegetation due to the migration of toxic fluids and could continue to create erosion impacts.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.
B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies.(Lake, Sonoma and Mendocino Counties; Division of Oil and Gas; State Lands Commission)

Facts Supporting the Finding:

The potential for migration of contaminates affecting vegetation mortality as a result of improperly abandoned wells will not be significant providing well abandonment regulations of the State Division of Oil and Gas, and the State Lands Commission are complied with. Overall, impacts on vegetation, sensitive plant species, and wildlife following structure abandonment and site restoration are expected to be positive, providing that replanting of the site utilizes species native to the area.

All potentially significant adverse impacts to vegetation and wildlife resulting from the abandonment phase of the project can be mitigated to levels of insignificance by implementing measures to restore the project sites as follows:

- Prior to abandonment of any geothermal facilities a revegetation and landscaping plan shall be developed which utilizes native plant species of the area. Source material for revegetation shall be local in order to minimize disruption of the genetic structure of adjacent, undisturbed plant populations. The plan shall specify finished grades and shall include provisions for monitoring and care of the vegetation until the plants are established, so as to ensure that the revegetation is successful (FEIR Mitigation Measure #34).

- All project pipelines, wellheads, equipment, and structures shall be removed prior to project abandonment (FEIR Mitigation Measure #35).

BIOLOGICAL RESOURCES: Cumulative Impacts

Impact: Removal of additional acreages of habitat within The Geysers area would have a significant cumulative impact on plant communities and wildlife habitat.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies.(Lake, Sonoma and Mendocino Counties; Division of Oil and Gas; State Lands Commission; Regional Water Quality Control Board).

Facts Supporting the Finding:

The Geysers-Calistoga KGRA contains an extensive array of plant communities and wildlife habitat, most of which are well represented by sizeable acreages within the project areas. These include serpentine chaparral, mixed chaparral, mixed evergreen forest, yellow pine woodland and forest, oak woodland, and riparian habitat. Removal of additional acreages of these habitats

within The Geysers area, up to 283 ha (700 ac) according to the cumulative scenario, would have a significant cumulative impact on plant and wildlife communities. In addition, there would be significant cumulative impacts on sensitive habitats, particularly serpentine chaparral, old-growth yellow pine woodland, and riparian communities. This is due to representation in the leaseholds of sizeable portions of the Mayacmas Mountains and Cobb Mountain, which are notable within the KGRA in terms of their high frequency of rare plant occurrences and large extent of riparian (Mayacmas Mountains) and old-growth yellow pine woodland (Cobb Mountain).

Cumulative impacts on breeding habitat for sensitive wildlife species which are known to reside or nest in the KGRA, including peregrine falcon, southern bald eagle, golden eagle, osprey, and yellow-billed cuckoo, would not be significant because these species do not nest or reside in the project areas. However, development in the project areas would result in a potentially significant cumulative loss of foraging habitat for raptors, including red-tailed hawk and possibly golden eagle, that may reside outside of the leaseholds. Cumulative loss of wildlife habitat in general, including breeding and foraging habitat for passerine birds and mammals, would be significant. In that siting considerations for cumulative projects can take into account biological habitats, the actual impact is dependent upon the care in which individual projects are designed and undertaken.

No additional mitigation measures are proposed for cumulative vegetation and wildlife impacts. Implementation of the vegetation and wildlife mitigation measures described for the various phases of the project are feasible and will reduce the cumulative significant adverse impacts to insignificant levels.

BIOLOGICAL RESOURCES: Cumulative Impacts

Impact: Cumulative effects of siltation, introduction of spilled toxic substances, and lowering of the water levels in streams could significantly degrade aquatic resource habitat.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies. (Lake, Sonoma and Mendocino Counties; Division of Oil and Gas; State Lands Commission; Regional Water Quality Control Board).

Facts Supporting the Finding:

Major geothermal development siltation events and material spills have had at most short-term detectable impacts. However, measurements of increased siltation in the vicinity of geothermal operations and corresponding declines in trout have suggested that there may be some long-term

cumulative effects. The potential for cumulative impacts to aquatic resources from geothermal development in The Geysers-Calistoga KGRA was recognized by the staff of the CEC as well as by public planning and regulatory agencies. In response to this concern the KGRA Aquatic Resources Monitoring Program was established in 1981 to monitor water quality, sediments, benthic macroinvertebrates and fish populations (McMillan, 1985). Similarly, to address both short-term and long-term impacts of geothermal development in the Squaw Creek Watershed, the Squaw Creek Aquatic Monitoring Program was established in 1984 (Jordan et al., 1990). To date, it has been very difficult to separate long-term cumulative impacts of stream degradation due to geothermal operations from natural perturbations in The Geysers area.

Because the rate of future development will be less than in previous decades, it is unlikely that there will be significant cumulative impacts on aquatic resources. Because many of the roads and other infrastructure are already in place and because environmental regulations are more stringent than they were prior to the 1980s, each future project should have less impact in terms of siltation, potential for accident and inputs of toxic materials than previous projects, especially those prior to 1980.

Strict adherence to the mitigation measures proposed to control siltation, accidents, and inputs of toxic chemicals as stated previously will help to ensure that cumulative impacts in The Geysers area on aquatic resources are insignificant. As discussed previously, diversion of surface water sources has been considered as a source of reservoir reinjection fluid. Such activities could have significance impact on aquatic resources in downstream watersheds.

CULTURAL RESOURCES: **Exploratory Drilling, Field Development, Operation and Maintenance Activities, and Abandonment Phases**

Impact: Significant adverse impacts to cultural resources could occur during any phase of the project where ground disturbance will occur.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies. (Lake, Sonoma and Mendocino Counties).

Facts Supporting the Finding:

Road widening and cutting/filling activities will further disturb known sites which have already been impacted by existing roads and trails. Drill pad and sump construction will involve fairly level areas where cultural sites are likely to be encountered and/or will require extensive clearing and cutting and filling which will disturb relatively large amounts of land, making significant cultural resources impacts highly probable.

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As development wells will largely utilize existing pads and access, anticipated impacts are similar but on a much smaller scale than for that of exploration. The installation of power plants will require a large amount of land. However, as 80 to 90 percent of the land required will remain relatively undisturbed, it may be possible to optimize the areas of heavy disturbance with regard to conflict with cultural resources. Since most prehistoric sites are small, flexibility in the placement of pipeline systems and power transmission towers should allow site avoidance.

Abandonment of facilities involves some contouring and re-landscaping facilities areas. Activity should be restricted to the originally disturbed area to avoid potential impacts to cultural resources.

Potential impacts to cultural resources will be mitigated by measures requiring avoidance and or additional survey and testing to determine importance of resources. These measures apply to all phases of the project during which ground disturbance will occur:

- Since steep slopes and dense vegetation precluded intensive physical survey of all land surfaces, it is recommended that additional survey be conducted in these areas on a site-specific basis once areas to be impacted by development are identified (FEIR Mitigation Measure #1).

- Wherever possible, sites of possible cultural interest shall be avoided through redesign of facilities (FEIR Mitigation Measure #2).

- Minimum mitigation measures for all sites to be impacted shall include initial testing (excavation) to determine whether subsurface deposits exist, and collection and mapping of representative lithic debris and all formal tools. An "enhanced" inventory method incorporating these procedures has been developed (Fredrickson, 1985) which would also allow for evaluation of research potential for recorded sites. As these procedures determine presence or absence of subsurface deposits, permit an age estimate and age range of site use (through obsidian hydration) and provide site-type analysis, Fredrickson estimates that impact mitigation for approximately 50 percent of all prehistoric sites could be accomplished at this stage. This would include virtually all surface lithic scatters (FEIR Mitigation Measure #3).

- For sites with subsurface deposits, further testing (formal excavation) shall be required, with results of initial testing serving as basis for a research design. For many of these sites (estimated by Fredrickson at 25 percent of the total), information potential would be realized at this stage (FEIR Mitigation Measure #4).

- Another 25 percent of sites is estimated to have the potential to address additional significant research questions. For these remaining sites with a high level of significance (e.g., those with midden and/or structural remains), avoidance may become a reasonable alternative. According to Fredrickson (1985), lithic sites that yielded particularly important material (e.g., Paleoindian or Lower Archaic) would be included in this category (FEIR Mitigation Measure #5).

- o Where a potential for buried sites exists, construction activities shall be monitored by qualified individuals. Should buried resources be discovered, grading or construction activities will be redirected until a determination of importance can be made by the monitor (FEIR Mitigation Measure #6).

- o The Native American Commission will be informed prior to any construction in areas of known or suspected cultural resource sensitivity (FEIR Mitigation Measure #7).

PALEONTOLOGICAL RESOURCES: Exploratory Drilling, Field Development, Operation and Maintenance Activities, and Abandonment Phases

Impact: As with cultural resources, significant adverse impacts to paleontological resources could occur during any phase of the project where ground disturbance will occur.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies. (Lake, Sonoma and Mendocino Counties).

Facts Supporting the Finding:

Any ground disturbing activities could result in potential impacts to fossil resources. In that many of the fossil specimens known to occur in the area are relatively common in terms of assemblage and taxa, significance is attributed to the less common resources. Given the importance of resources which are known in the area, substantial adverse impacts to rare or high interest resources is not predicted. However, the potential does exist, thus, the impact is categorized as significant and will be mitigated by conducting additional surveying and monitoring of construction during appropriate development activities.

- o For each specific sublease area, a qualified paleontologist shall be retained by the applicant to develop a program of onsite monitoring of significant paleontologic resources including fresh exposures, bulk sample screening, and salvage of specimens. This program shall include a literature and records search to assess specific areas of sensitivity to fossil resources. A paleontologic resource sensitivity map of the project area can then be prepared showing the paleontologic importance of each rock unit to be exposed as well as the overall paleontologic sensitivity (FEIR Mitigation Measure #8).

- o An excavation monitoring program designed to locate and salvage significant paleontological resources. Paleontologic monitors shall be equipped to salvage fossils as they are unearthed to avoid construction delays and to remove samples of sediments

which are likely to contain the remains of small mammals. The monitor shall be empowered to temporarily halt or divert grading equipment to allow removal of abundant or large specimens. Sediment samples may be removed in bulk to off-site screening locations (FEIR Mitigation Measure #9).

- o Recovered specimens shall be prepared to the point of identification (FEIR Mitigation Measure #10).

- o Specimens shall be curated into an established repository (FEIR Mitigation Measure #11).

- o Preparation of a report of findings with an appended itemized inventory of specimens and taxa. The report and inventory, when submitted to the appropriate lead agency, signifies completion of the paleontologic resource impact mitigation program (FEIR Mitigation Measure #12).

CULTURAL AND PALEONTOLOGICAL RESOURCES: Cumulative Impacts

Impact: Areas to be developed under the cumulative scenario will contain cultural and paleontological resources which may be inadvertently adversely affected by geothermal activities.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies. (Lake, Sonoma and Mendocino Counties).

Facts Supporting the Finding:

Substantial and important cultural and paleontologic resources exist in The Geysers area as demonstrated by previous projects. Undoubtedly, areas to be developed under the cumulative scenario will contain cultural resources which may be inadvertently, adversely affected by such activities as non-drilling exploration where ground disturbance, but no formal grading is involved. Impacts to cultural and paleontological resources can be mitigated by conducting field studies of potential project sites prior to grading activities or by having cultural and paleontological resource experts monitor grading or exploration activities as proposed on a site-specific basis.

Mitigation for significant cumulative impacts to cultural and paleontological resources are the same as those listed for site-specific impacts.

Mitigation for significant cumulative impacts to cultural and paleontological resources are the same as those listed for site-specific impacts.

TRANSPORTATION: Exploratory Drilling

Impact: Traffic generation under exploratory drilling phases is potentially significant from the standpoint of creation of to existing rural traffic.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; Caltrans).

Facts Supporting the Finding:

During the exploration phase the drill rig and all support equipment and structures are transported to the drill site. Frequent heavy vehicle traffic includes delivery and removal of equipment and supplies, delivery of well casings, delivery of water, and removal of geothermal wastes and sewage. It is estimated that 50 to 60 trips per day per will occur during the 6 to 12 month exploratory drilling phase. This figure includes both light and heavy vehicle traffic.

The following mitigation measure to provided safety measures for equipment transportation over local roads have been adopted to reduce adverse exploratory phase transportation impacts to insignificant levels:

- To reduce hazards, oversized vehicles should be preceded and followed by warning vehicles as required by state and county regulations. In addition, when existing road conditions dictate, specific routing and restricted time of operation may be required on certain roadway segments (FEIR Mitigation Measure #1).

- Potential conflicts can be reduced with development project trucking scheduled to avoid hours of greatest potential conflict, e.g. school bus runs (FEIR Mitigation Measure #2).

- Overall traffic volumes can be reduced through high occupancy vehicle measures, e.g., car pooling, project buses (FEIR Mitigation Measure #3).

- The lessee/operator should provide to its contractors and vendors a detailed map of the area for distribution to truck drivers. The map shall include a) all dangerous curves/elevation points highlighted in red, b) speed limits/reduced limits depicted on the map, c) safe locations for vehicle inspections, and d) a serious warning clause/penalties

if drivers violate any safety procedures while traveling on leasehold roads (FEIR Mitigation Measure #4).

- Due to the poor conditions of roads in The Geysers area, it is recommended that road reconstruction should occur prior to the start of geothermal development construction. Otherwise, nondesign traffic loads will exacerbate existing conditions (FEIR Mitigation Measure #5).

TRANSPORTATION: Field Development

Impact: The initial field development activities will generate significant and adverse levels of traffic, though the duration of impact is short-term.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; Caltrans).

Facts Supporting the Finding:

Production drilling generates transportation-related movement of drill rigs, drilling crews and necessary equipment to the well site. The California Energy Commission transportation study (1981) estimated that 35 semi-trailer loads are required over a 3-day period to move the equipment needed for setting up one drill rig. Transport of equipment and supplies will generate daily traffic levels of 900-kg (1-ton) truck traffic (3-4 trips), car traffic from drilling crews, supervisory and administrative personnel (20-30 trips). Casing deliveries are normally made in 1,814-kg (20-ton) loads, sporadically throughout the first 40-60 days of drilling operations. Another 10 to 12 trips per day are made to delivery water and haul wastes.

Well field development generates more traffic than any other phase of geothermal development. From 80 to 100 trips per day are generated over the 24 to 36 month typical well field development period for a power plant.

The power plant construction phase of development has the greatest impact on the transportation network in terms of loads. Steam turbines weighing up to 90,720 kg (100 tons) or more are transported to the geothermal sites during this phase. Overload permits are required for these loads. The volume of tractor trailer rigs and trucks hauling heavy equipment to the site also increases during this phase. This type of traffic causes congestion and safety problems where these vehicles must cross the roadway centerline to negotiate turns. The transport of construction personnel is also at its peak during this phase. Power plant construction activities normally involve 20 to 40 trips per day over a 36-month construction period.

The following mitigation measure encouraging use of local and county sources of services for geothermal projects have been adopted to reduce adverse exploratory related transportation impacts to insignificant levels:

- o All measures included in Exploratory Drilling are applicable to Field Development (FEIR Mitigation Measure #6).

- o A transportation permit from Caltrans is required for all loads on state highways which exceed established limits as to width, height, and weight.

- o The geothermal industry is encouraged to use local contracts and services, and to purchase material equipment, and supplies from sources within the county (FEIR Mitigation Measure #7).

TRANSPORTATION: Operation and Maintenance

Impact: The operation and maintenance activities will potentially generate significant and adverse levels of traffic during the life of project operations.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; Caltrans).

Facts Supporting the Finding:

Power plant operations and well field maintenance typically generate 30 to 50 trips per day over the life of any one geothermal power plant and well field development project.
This level of traffic is much less than during the field development phase.

Impacts from traffic generation during this phase are mitigated by encouraging employees to ride the commuter buses provided specifically for geothermal industry workers in The Geysers or to carpool, as follows:

- o To reduce project-generated traffic levels, employee car pools or use of the geothermal worker commuter bus system should be established (FEIR Mitigation Measure #8).

TRANSPORTATION: Abandonment

Impact: Upon abandonment, geothermal roads may continue to provide access to the project area, but will be prone to the impact of erosion.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; California Regional Water Quality Control Board; Caltrans).

Facts Supporting the Finding:

Trip generation during the abandonment phase involves dismantling and removal of certain equipment and well abandonment. Heavy equipment may also be needed for minor contour grading. It is expected that trip generation would be on the low side of the exploratory drill phase traffic, or about 30 trips per day over a 3 month abandonment procedure. This short-term impact is not significant.

Upon abandonment, access roads may be either restored or left intact for use by landowners. To prevent significant impact from erosion of unsurfaced roads, the following measure is adopted:

o If approved by appropriate agencies, level areas and roads created by geothermal development may be retained for other beneficial uses, provided that effective erosion control measures have been implemented (FEIR Mitigation Measure #12).

TRANSPORTATION: Exploratory Drilling, Field Development, and Abandonment

Impact: Development of the proposed leaseholds, coupled with continuing regional development, will incrementally increase roadway deterioration as a result of the transport of heavy trucks and equipment, will require more frequent repairs, and will be result in increased maintenance costs.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have

been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties).

Facts Supporting the Finding:

The cost of previous roadway improvements or widening often has been allocated to the geothermal developers as a condition of approval for a project. It has also been the responsibility of the developers to resurface and maintain roadways from the well sites and facilities within the leasehold to the proximate highways.

Significant traffic increases are not anticipated to occur along the principal state highways in the region, although slow-moving trucks may constitute a traffic hazard. Specifically, geothermal activity in Project Areas No. 1 and 2 will create a potential nuisance and driving hazard on Cloverdale-Geyser Road. Slow moving trucks climbing steep grades, the narrow road, and inadequate sight distance for passing are contributing factors. Due to the developed nature of geothermal access roads in the vicinity of Cobb Mountain, no significant safety impacts are predicted for access to Project Area No. 3.

The following mitigation measures to fund needed roadway repairs and improve operating safety have been adopted to reduce the adverse transportation impacts to insignificant levels:

- Project-related impacts to the roadbed of local county roadways shall be mitigated through specific agreements between the developer/operator and the county. In some instances, joint funding among several geothermal operators for the initial cost of roadway repair and continued maintenance has been required for roadways utilized by more than one operator (FEIR Mitigation Measure #9).

- Other mitigation measures that may be required of the project include the preparation of a traffic safety plan by the applicant which addresses sign requirements and the coordination of heavy truck traffic, and off-site parking arrangement such as Park n' Ride (FEIR Mitigation Measure #10).

- The counties shall discourage the use of private access roads to steam fields by the general public (FEIR Mitigation Measure #11).

AIR QUALITY: Non-Drilling Exploration

Impact: Non-Drilling exploration will generate air emissions from incidental use of diesel powered equipment and vehicles as well as associated dust generation.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; Local Air Pollution Control Districts; State Lands Commission).

Facts Supporting the Finding:

The incidental and sporadic activities during Non-drilling exploration generally will not create significant air emissions, although all such activities are subject to compliance with local Air Pollution Control District regulations as follows:

- Compliance with local APCD rules and regulations relative to equipment operation and dust control will ensure that Non-Drilling Exploration impacts remain insignificant. This includes consideration for asbestos hazard from disturbance of serpentine soils as defined in Measure 3a below (FEIR Mitigation Measure #1).

AIR QUALITY: Exploratory Drilling and Field Development - Drilling Activity

Impact: Potentially significant air pollutants will result from the diesel powered drilling equipment and from truck and passenger vehicles commuting to the drill site.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; Local Air Pollution Control Districts).

Facts Supporting the Finding:

Typical drilling diesel prime mover fuel consumption is estimated at about 1,890 li (500 gal) per day. This consumption is based on an assumed 400-horsepower diesel engine operating with a specific fuel consumption of approximately 0.05 gal/hp/hr (EPA 1990). For industrial diesel drives, each liter (0.26 gal) of fuel burned produces about 0.45 kg (1 lb) of oxides of nitrogen, 0.006 kg (0.014 lb) of carbon monoxide, and minor amounts of particulates, unburned hydrocarbons, and sulfur oxides. Since baseline levels of these pollutants are very low, the addition of the diesel emissions will not exacerbate air standards beyond a few feet from the exhaust stacks. Vehicular emissions, involving only a few vehicles dispersed through the area, similarly do not pose any threat to healthful levels of air quality.

Though exploratory well drilling and transportation activities generally will not create significant air emissions, such activities are subject to compliance with local Air Pollution Control District regulations as follows:

- o Compliance with local APCD rules and regulations relative to equipment operation and dust control will ensure that Non-Drilling Exploration impacts remain insignificant. This includes consideration for asbestos hazard from disturbance of serpentine soils as defined in Measure 3a below (FEIR Mitigation Measure #1).

AIR QUALITY: Exploratory Drilling and Field Development - Site Preparation

Impact: Activities to prepare a drill site, excavate the sump, move equipment into position, and travel on unpaved roads produce potentially significant levels fugitive dust.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; Local Air Pollution Control Districts).

Facts Supporting the Finding:

Much of the fugitive dust generated during site preparation settles out on nearby foliage, but the smallest particles remain suspended in the air and are dispersed regionally. The EPA suggests a universal dust emission factor of 1,090 kg/acre/month (1.2 tons/acre/month) of activity (EPA-AP 42) which can be reduced by about 50 percent through regular watering. Similarly, each kilometer of unpaved road travel by one vehicle at 30 mph adds about 28 gm of dust to the air. The regional particulate load levels in the air basin will not be significantly affected by these fugitive dust emissions. Locally, dust settling out on nearby surfaces may retard plant growth along the shoulder of dirt access roads and dust plumes along the ridgeline may create objectionable visible dust plumes during the dry summer months. Such impacts are transitory and localized, but can be mitigated by watering down the drill site and by maintaining and enforcing reasonable speeds on dirt access roads, as follows:

- o Fugitive dust generation during drilling activities should be minimized by enforcing reasonable driving speeds on dirt roads, by using water or oil spray to control dusty areas, and by performing major grading activities in spring when natural soil moisture is high (FEIR Mitigation Measure #3).

- If serpentine soils are detected in pre-construction soil surveys, such areas shall be avoided to the maximum extent possible. If avoidance is not possible, testing shall be conducted to determine whether concentrations of asbestos exceed 1 percent. If so, construction workers and superintendents shall use OSHA-approved respiratory equipment and receive OSHA-approved training in methods to reduce their exposure and downwind receptors. Other measures consistent with APCD regulations shall be implemented (FEIR Mitigation Measure #3a).

AIR QUALITY: Exploratory Drilling and Field Development - Well Drilling, Testing and Cleanout

Impact: Geothermal exploration and development activities may result in the venting of steam containing potentially hazardous gases such as H_2S which could reach significant concentrations downwind under adverse meteorological conditions.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; Local Air Pollution Control Districts).

Facts Supporting the Finding:

During testing, a well may produce about 68,000 kg (150,000 lb) of steam per hour, assuming a vapor-dominated resource. Using The Geysers average of 222 ppm of non-condensible H_2S in the steam, about 15 kg (33 lb) of H_2S could be released each hour during a full flow test.

During drilling, a supplementary abatement system can reduce escaping H_2S levels to protect the drilling crew and any nearby receptor. However, during venting and clean-out, the total H_2S burden will be released to the atmosphere. The initial momentum and buoyancy of the plume precludes any localized H_2S impacts, but the downwind transport of this plume could create significant H_2S impacts under adverse meteorological conditions.

Without on-site data, it is difficult to define "adverse meteorological conditions." However, initial calculations show that for a plume rise of 30 m (100 ft), the maximum impact occurs within 1 km under neutral or slightly stable conditions. Maximum concentrations beyond 2 km (1.25 mi) occur at night ("F" Stability) with violations of the California H_2S standard predicted to occur at receptor sites beyond 3 km (1.8 mi) from the source. As the plume rise increases to 50 and 100 m (80 and 300 ft), the ground level concentration drops to below the standard with maxima still occurring in the morning and evening hours near the site, and highest concentrations still occurring at night although at greater distances. Even with 100 m (300 ft)

plume rise, ground-level concentrations of 6 to 8 $\mu g/m^3$ (15 to 20 percent of the standard) could still cause the standard to be exceeded if background levels are high enough.

The following measures specifying the timing of venting and requiring BACT have been adopted to reduce adverse H_2S emissions to the extent possible:

- In order to minimize population exposure to high H_2S and other gaseous pollutant levels, venting occurring during the day with light winds will allow the stream plume to disperse well above the surface. Venting at night could impact populated areas adversely and should be limited by conditions placed on air pollution permits during the permitting process. By adjusting operational procedures to fit atmospheric dispersion conditions, the drilling process can be carried out without objectionable H_2S impacts. In instances where it is impractical or impossible to schedule emissions releases to coincide with good meteorological conditions, available portable abatement equipment can be utilized to reduce emissions to acceptable levels. Automated controls should be readily available to anticipate well connection and operation as soon as possible upon well completion (FEIR Mitigation Measure #2).

- The Best Available Control Technologies (BACT) or other state of the art technology (i.e., Stretford process or Hydrogen Peroxide process) shall be implemented to ensure H_2S emissions are below Air Pollution Control District limits (FEIR Mitigation Measure #5).

- Control of particulate emission during drilling should be performed by use of a properly sized wet cyclone using at least 60 gpm water injection. If a resource high in arsenic or other toxic material is encountered, mitigation of significant emissions should be accomplished by available remedies to be selected by the applicant and approved by the applicable air pollution control district (FEIR Mitigation Measure #6).

AIR QUALITY: Exploratory Drilling and Field Development - Well Bleeds

Impact: The impact from well bleeding, particularly if there are several such sources in the same area bleeding simultaneously, could cause H_2S to be carried to downwind receptor areas in sufficient quantity as to constitute a significant air quality impact.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; Local Air Pollution Control Districts).

Facts Supporting the Finding:

After testing is completed, wells may be placed on stand-by mode with a slow bleed to maintain a stable well bore temperature and prevent accumulation of condensate, precipitate, or loose well bore material. Otherwise, the wells may be plugged with redrilling occurring consistent with the actual production sequence. Most wells need only a small steam flow rate, but some "wet" wells require a considerable bleed rate to prevent loss of the well. Flow rates range from several hundred pounds of steam per hour to as much as 10 percent of full flow.

In addition to implementing H_2S abatement measures as described above, the impact is further mitigated by the installation of well throttling systems as follows:

o Remote throttling systems should be installed on the wells. In the interim before they are installed, lessee should agree to a throttling schedule to achieve given emissions reduction percentages during stacking situations using on-site personnel to manually turn the valves (FEIR Mitigation Measure #4).

AIR QUALITY: Exploratory Drilling and Field Development - Well Blowouts

Impact: Significant adverse air emission impact would occur from H_2S emitted during a well blowout.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; Local Air Pollution Control Districts).

Facts Supporting the Finding:

Operational disruptions could result in a casing failure near the surface unless adherence to mandatory regulations is strictly enforced. If steam had been encountered, it may escape without any controls. Deeper blowouts pose similar hazards, but are usually protected with mandatory blowout prevention equipment. One of the largest H_2S sources in The Geysers would be a single uncontrolled well, and there is a remote possibility of a recurrent event. Such an event could cause a serious impact because decreased plume buoyancy would allow high H_2S concentrations to be injected into low-level inversions, with potential nocturnal drainage flow toward populated receptor sites.

Measures to guard against blowouts have been adopted in relation to system safety impacts (see Systems Safety: Exploratory Drilling, FEIR Mitigation Measures #3 and #4). However, should

there be a blowout or other uncontrolled situation, H_2S emissions could significantly affect populated areas based on area meteorology and known air flow mechanics. While the occurrence of such an accident is very unlikely, the resulting impact is not mitigable.

The EIR evaluated several alternatives which could have the potential to reduce or eliminate the identified environmental impacts.

No Project Alternative

Implementation of the No Project Alternative would mean that the State Lands Commission would not offer any of the lands within the study area for leasing for geothermal resources. These resources would remain undeveloped for the foreseeable future. From the standpoint of the unavoidable adverse impact of a well blowout with unabated hydrogen sulfide emissions, adoption of this alternative would eliminate the impacts from project areas.

It is noted however, that the No Project Alternative would deny the State of California revenues from the leasing program. Also since the steam resource of The Geysers area is diminishing, the resources on the site may diminish over time so that development may not be cost feasible in the future. The energy lost by the No Project Alternative would need to be made up from some other source, most probably fossil fuels. In addition, the probability of a blowout, with current BOPE installed is remote.

Leasing Portions of the Project Areas

This alternative involves leasing one or two of the three project areas identified for prospective leasing. The reasons for omitting any particular leasing area could be numerous; however, this analysis assumes that the reason would be to avoid a potential blowout. Emissions of hazardous substances has a potential for occurrence with aspects of geothermal activity involving exploratory drilling, and field development and operations where ever they occur. Since this alternative does eliminate such activity, the unavoidable adverse impacts could still occur.

Prohibiting Construction of Power Plants

This alternative would allow construction of steam fields in the area, but not development of new power plants. Potential for a well blowout, though remote, would remain a possibility in the area under this alternative.

Alternative Land Uses

This alternative is based on the assumption that the State Lands Commission could encourage alternative land uses, other than geothermal uses, to be established on the leasehold areas. The State Lands Commission is limited in its ability to establish or encourage land uses beyond its jurisdiction to lease lands for resource and mineral development. Local land use approvals for any use subsequent to leasing are under the purview of the local county governments with jurisdiction. The state does own the lands on Cobb Mountain within the designated lease area and would have some land use authority there. Uses other than ge[illegible]

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not involve hazards from potential well blowout. The adoption of this alternative could eliminate the impact, however, the State Lands Commission has limited ability to implement such an alternative.

Alternative Technology

This alternative assumes that alternative technologies could be implemented to exploit the geothermal resources of the project areas. The need for implementation of alternative technologies has several purposes, including the reduction in the physical environmental impacts of more traditional geothermal development, and the extension of the life of The Geysers steam field through conservation and more efficient use of the resources. However, this alternative does not eliminate the need for drilling and extraction of geothermal resources nor the associated, though remote, potential for a well blowout.

In conclusion, only the No Project and Alternative Land Use Alternatives have been shown to reduce the unavoidable impact of an accident involving geothermal well blowout. Neither of these alternatives allow the State Lands Commission to fulfill its obligations under the Geothermal Resources Act and are not considered feasible, not withstanding efforts by State Lands Commission to minimize to the extent practicable, the significant adverse impacts associated with well blowouts and hydrogen sulfide emissions.

AIR QUALITY: Operation and Maintenance - Well Drilling

Impact: During operation and maintenance phases, it is often necessary to maintain, redrill, and drill new make-up wells which would have similar air emissions impacts as the exploratory phase well drilling activity.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; Local Air Pollution Control Districts).

Facts Supporting the Finding:

During operation and maintenance phases, it is often necessary to maintain, redrill, and drill new make-up wells. Emissions from these sources would be similar to the emissions discussed above for the exploratory phase and are adopted as follows:

o All measures listed for Exploratory Drilling and Field Development are applicable to the Operation and Maintenance phase (FEIR Mitigation Measures 7).

AIR QUALITY: Operation and Maintenance - Power Plants

Impact: The increase in H_2S emissions which may be caused by steam stacking at an unabated plant, and/or release of the combined steam flow from a number of wells at a plant could have significant adverse impact on air quality.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; Local Air Pollution Control Districts; California Energy Commission).

Facts Supporting the Finding:

Location of the plant site relative to prevailing air flows and stability structure is a dominant effect on H_2S dispersion patterns. Plumes from ridgelines may experience occasional suppressed rise from strong winds with corresponding elevated downwind H_2S concentrations. However, if the elevated buoyant plumes are released near the base of a valley inversion, they will tend to penetrate the inversion with a resultant reduced ground level H_2S impact. Plumes released at lower elevations will often have difficulty in penetrating the inversion. Under these conditions, downwind transport of the plume could create high H_2S concentrations under adverse release conditions.

The combination of abatement equipment, higher natural plume rise from many single wells combined into one large source, and the ability to throttle and possibly divert the steam flow, all reduce the ambient air quality impact from the power plant over the uncontrolled emissions of the well at the wellhead. However, because the flowfield is more complex and the combination of abatement, throttling, intertie, plume rise, etc. at the power plant are more difficult to estimate, it is more difficult to predict the impact from a power plant than from a single, isolated well.

Mitigation of H_2S impacts from power plants to receptors is accomplished by implementing the following abatement and location measures:

- Any new facility must undergo an analysis to determine if it threatens, delays, or prevents the attainment the 30 ppb hourly H_2S standard. It must not contribute H_2S concentrations to the ambient environment such that the sum of this project plus the background concentration exceed the hourly standard (FEIR Mitigation Measure #8).

- An $NaOH/H_2O_2$ abatement system should be installed and ready for operation prior to initiating drilling with compressed air. Injection sh[illegible]

concentrations of H_2S are encountered. Blowout control equipment shall be installed after installation of casing and materials should be available within the immediate Geysers area for timely emergency response (FEIR Mitigation Measure #9).

- Project objectives should be to identify optimal power plant location and develop operational plans to avoid severe air quality impact events (FEIR Mitigation Measure #10).

- Continuous monitoring of radon-222 in off gas noncondensible treatment stream shall be instituted to ensure that the level of emissions remains low (FEIR Mitigation Measure #12).

AIR QUALITY: Operation and Maintenance - Abatement Technologies

Impact: Hydrogen sulfide emissions and their abatement relating to well development and maintenance and steam transmission remains problematical and a potentially significant adverse impact of geothermal development.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; Local Air Pollution Control Districts; California Energy Commission).

Facts Supporting the Finding:

The introduction of abatement equipment in condenser/cooling tower systems has greatly reduced emissions and, correspondingly, the ambient hydrogen sulfide concentrations. Theses systems include the Stretford Process, the Vent Gas Incineration System, and the noncommercial EIC process.

Newer plants should be less likely to engage in untreated stacking due to the adaption of turbine bypass design of the plants. Simply put, this system reroutes steam to the condenser (and associated abatement equipment) if mechanical problems develop or simply through the abatement equipment alone, until steam flow can be reduced or power generation resumes. With these techniques in use, new power plant emissions of H_2S have been reduced to benign levels.

Abatement of emissions from well development and maintenance and from steam transmission is still problematical. Given current stacking control technology, effective treatment of the and the cost of effective abatement is high. It appears that significant technological advances are needed if these intermittent, distributed sources are to be effectively controlled.

Because of these uncertainties, continued research and legislative mandate are encouraged to spark the necessary technological innovation to effectively abate hydrogen sulfide constituents in geothermal steam as follows:

- Requirements to make geothermal steam field-power plant technological improvements in operational management and in pollutant abatement systems should be encouraged and legislated. Promising systems should be tested and used to retrofit older plants so that standards of H_2S emissions can be realized (FEIR Mitigation Measure #11).

AIR QUALITY: Operation and Maintenance - Abatement Technologies

Impact: Site abandonment may create significant adverse impacts due to site grading, demolition, or capping of wells.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; Local Air Pollution Control Districts; California Division of Oil and Gas;).

Facts Supporting the Finding:

Abandonment activities include minor site grading, revegetation, facilities demolition or dismantling and shutting in or down of active wells. Impacts are similar to construction activities and are potentially significant. Measures to mitigate such impacts, including preparation of a plan of abandonment, and control of fugitive dust will be implemented as follows:

- A plan of abandonment shall be prepared prior to removal of any equipment from geothermal sites. The plan shall include a residuals and hazardous materials survey and sampling program to ascertain quantity and quality of potential residual and hazardous materials. Based on the survey, the proper procedures for demolition and disposal shall be developed, incorporating BACT, and submitted to the appropriate County agency for approval (FEIR Mitigation Measure #13).

- Steam emissions from idle wells should be minimized through the use of gas caps, temporary plugs, and timely abandonment procedures (FEIR Mitigation Measure #14).

- Fugitive dust generation from site demolition and material removal should be minimized by enforcing reasonable driving speeds on dirt roads and through use of water spray. Precautions relative to serpentine soils shall be implemented as discussed in Measure 3a above (FEIR Mitigation Measure #15).

AIR QUALITY: Cumulative Impacts

Impact: Cumulative air quality impacts from additional geothermal development will result in increased emissions from various vehicular and geothermal sources, including emissions of hydrogen sulfide and other potentially harmful and toxic elements such as ammonia, arsenic, boron, mercury, radon-222, silicon, sulfur dioxide and sulfates.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties; Local Air Pollution Control Districts).

Facts Supporting the Finding:

According to Lake County (1989), existing operations in The Geysers area generate a potential for 307 kg (6,770 lb) per hour of uncontrolled H_2S emissions, although application of control technology reduces the emissions to approximately 172 kg (380 pounds) per hour. By proportion, cumulative projects would increase the H_2S generation rate to approximately 3,785 kg (8,344 lb) per hour uncontrolled, or 212 kg (468 pounds) per hour controlled. Depending upon location of cumulative projects and micrometeorological effects, it is possible that H_2S levels could exceed the hourly standard in some populated areas of Lake County (such as Anderson Springs and Cobb Valley).

As mentioned in Section 4.9.3, the major sources of emissions include blowouts (uncontrolled well venting), bleeding (when wells are on stand-by) and stacking (incurred when a facility is "throttled back" and steam is vented directly to the atmosphere). Though these may not constitute serious emissions sources in of themselves, the cumulative impact from all existing facilities in addition to those which could conceivably be built is considered significant.

The measures to mitigate cumulative impacts from H_2S emissions are the same as listed for site-specific impacts, that is FEIR Mitigation Measure #2, #4, #5, #8, #9, #10, and #11. Thought the probability of a blowout or an uncontrolled well is extremely low the resulting potentially high hydrogen sulfide emissions are not mitigable.

The EIR evaluated several alternatives which could have the potential to reduce or eliminate the identified environmental impacts. The conclusions with respect to feasibility of alternatives is the same for cumulative impacts as was discussed for the site-specific impacts.

Of the alternatives considered, only the No Project and Alternative Land Use Alternatives have been shown to reduce the unavoidable impact of an accident involving geothermal well blowout. Neither of these alternatives allow the State Lands Commission to fulfill its obligations under the Geothermal Resources Act and are not considered feasible, not withstanding efforts by State Lands Commission to minimize to the extent practicable, the significant adverse impacts associated with well blowouts and hydrogen sulfide emissions.

ACOUSTICAL ENVIRONMENT: Non-Drilling Exploration Activities

Impact: Seismic surveys may subject nearby sensitive receptors to significant noise levels.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

Facts Supporting the Finding:

Typically, before the geothermal wells are located, various types of surveys will be conducted. These may include resistivity, seismic, gravity, and magnetometer surveys as well as others. Of these surveys, the only one which is noisy by nature is the seismic survey. This survey requires the use of a machine which either vibrates or pounds the ground. Assuming that the seismic survey "ground shaker" emits a noise level similar to a vibratory compactor, then the peak anticipated noise level is 82 dBA as measured at 15 m (50 ft). Based upon an atmospheric sound attenuation rate of 6 dBA per doubling of distance, a minimum distance of 366 m (1,200 ft) would have to be maintained between the machinery and the nearest sensitive receptor to reduce impacts to insignificant levels as provided below:

o Seismic surveys shall not be located closer than 366 m (1,200) ft from existing residences or other sensitive receptors (FEIR Mitigation Measure #1).

ACOUSTICAL ENVIRONMENT: Exploratory Drilling

Impact: Exploratory drilling activities may subject nearby sensitive receptors and on-site workers to significant noise levels.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties).

Facts Supporting the Finding:

Construction of access roads and well pads will require the use of heavy equipment such as bulldozers, scrapers, backhoes, water trucks, etc., which will generate noise levels of approximately 80 to 85 dBA at a distance of 50 feet. Additional noise will be generated by trucks delivering well supplies and during the well drilling operations. In addition to the adverse noise affects which would be imposed on any nearby sensitive of-site receptors, on-site workers could be subjected to significant adverse noise impacts.

The following mitigation measures requiring compliance with proposed noise standards and limitations on activities will be implemented to reduce these potentially significant acoustical impacts to below significant levels:

- The applicant shall meet a noise standard Ldn 50 dBA with a 10 dBA penalty between the hours of 10:00 P.M. and 7:00 A.M. of the following day at the nearest receptor. Noise levels from drilling operations will be muffled and times of operation limited so as not to constitute a public nuisance (FEIR Mitigation Measure #2).

- The hours of heavy truck traffic to and from the site will be restricted to between the hours of 7:00 A.M. and 7:00 P.M. only, except in cases of blowout, emergency pumping of the sump or threat of personal injury. Where necessary, traffic shall be rerouted away from noise sensitive areas to alleviate noise problems (FEIR Mitigation Measure #3).

- Drill pipes shall not be laid in bins between the hours of 8:00 P.M. and 7:00 A.M. the following day (FEIR Mitigation Measure #4).

- Developments in noise-sensitive locations shall not produce noise levels more than 10 dB greater than the 24 hour average pre-development ambient Leq for periods of greater than one hour in any 24-hour period (FEIR Mitigation Measure #5).

- Unless specifically waived by the applicable County Planning Commission, where legally permissible, the following minimum distances shall be observed in placing a well:

Outer Boundary of Parcel (Leasehold Agreement)	30 m (100 ft)
Public Roads	30 m (100 ft)
Residence	300 m (1,000 ft)
School	805 m (2,640 ft)
Hospital	1,610 m (5,280 ft)
Any other development	152 m (500 ft)

(FEIR Mitigation Measure #6)

- o Drilling, clean-out, and well testing and producing operations must be muffled at all times except in times of extreme emergency. There will be no changing of valves except on Monday through Saturday between the hours of 8:00 A.M. and 6:00 P.M. (FEIR Mitigation Measure #7).

- o No geothermal well shall be drilled within 0.8 km (0.5 mi) of any populated area (defined as more than 10 dwelling units established within 0.4 km [.25 mi] diameter area) or within 0.8 km (0.5 mi) of any recorded subdivision without consent of at least 75 percent of the owners having been obtained (FEIR Mitigation Measure #8).
- o Additionally, noise control practices require that all engines be fitted with mufflers as supplied by the manufacturer. Finally, the county advocates the use of the best available control technology for construction noise controls which might entail the use of berms, barriers, orienting equipment such that exhaust stacks point away from sensitive receptors and noisy equipment is physically shielded by quieter pieces, additional time-of-day restrictions, etc. (FEIR Mitigation Measure #9).

- o In accordance with OSHA regulations, all workers who are subject to noise in exceedance of the allowable levels will be provided with adequate hearing protection (FEIR Mitigation Measure #10).

- o Air drilling exhausts, well clean-out, and production tests should be directed through a cyclonic muffler/separator with water injection when feasible to give an attenuation to 90 dBA or less at 15 m (50 ft) (FEIR Mitigation Measure #11).

- o Major noise sources during drilling, such as engines, pumps and compressors, can be placed on the side of the pad away form the nearest receptor. Cyclonic muffler/separator and test mufflers shall be located on the side of the pad away from receptor locations, and stream flow directed away from them as well (FEIR Mitigation Measure #12).

- o Production tests shall be conducted into existing steam pipelines when possible (FEIR Mitigation Measure #13).

- o Noisy steam-handling equipment, steam piping, and steam ejector housing shall be insulated with materials possessing good acoustic and thermal properties (FEIR Mitigation Measure #14).

ACOUSTICAL ENVIRONMENT: Full Field Development

Impact: Power plant and production pipeline construction will produce significant daytime noise impacts.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma, and Mendocino Counties).

Facts Supporting the Finding:

Noise sources throughout all phases of plant construction include large diesel powered equipment, but the specific equipment varies with the phase and the contractor performing the work. Typical equipment includes; bulldozers, scrapers, cranes, cement mixers, tractor trailer rigs, backhoes, power generators, and cranes. Other spurious noises such as impact tools and steel handling will also take place. Additionally, the noise from the installation of the pipelines which carry steam from the well heads to the plant will generate noise, but as the amount of heavy equipment necessary to install the steam lines is limited relative to that involved in plant construction, and the placement and construction of the well pads will be situated to reduce noise impacts on sensitive receptors, no additional impacts are expected from pipeline construction. Considering the equipment requirements for this phase of the project, and assuming the standard atmospheric attenuation of 6 dBA per doubling of the distance, a distance of approximately 1,311 m (4,300 ft) will be necessary to attenuate the noise of plant construction down to 55 dBA.

The following mitigation measures requiring consideration of distance to receptors and noise monitoring will be implemented in order to reduce potentially noise impacts to insignificant levels:

- Measures listed for Exploratory Drilling are applicable to the Field Development Phase (FEIR Mitigation Measure #15).

- Mitigation measures for noise impacts involve the placement of wells, power plants, etc. at distances where the produced noise will be atmospherically attenuated to the regulatory noise levels at the nearby sensitive receptors. As the exact placement of equipment as well as the locations of nearby sensitive receptors is currently unknown, they will have to be evaluated on a case-by-case basis when deciding upon construction locations (FEIR Mitigation Measure #16).

- The counties should consider requiring the installation of permanent noise monitors at sensitive noise receptors near residential development (FEIR Mitigation Measure #17).

ACOUSTICAL ENVIRONMENT: **Operation and Maintenance**

Impact: Plant operations are expected to generate noise levels ranging up to 77 dBA at a distance of 50 feet from the source. Additional potentially significant adverse noise impacts may be generated by construction workers and employees commuting to work.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties).

Facts Supporting the Finding:

Plant operations are expected to generate a noise level of approximately 76 to 77 dBA at 17 m (50 ft). As plants will be in fairly continuous operation, they will be governed by the 50 dBA Ldn noise limit. To stay within this limit, the facility must not exceed a constant noise level of approximately 43 dBA Leq. Based upon the standard atmospheric attenuation of 6 dBA per doubling of distance, and a produced noise level of 77 dBA, approximately 823 m (2,700 ft) will be required to attenuate the plant noise down to this level of 43 dBA.
In addition to noise created as a direct result of plant and field operations, employees commuting to work have the potential to create noise impacts as a result of vehicle noise emissions. Because there is a reasonable potential to develop approximately 450 MW of additional geothermal energy from both Lake and Sonoma Counties, a worst case scenario could involve the construction of two plants simultaneously with six facilities already on-line. Project implementation assuming this scenario would raise future noise levels by less than 1 dBA Ldn.

Implementation of the following measures including use of proper mufflers and other operational factors to reduce noise will mitigate noise generation to insignificant levels:

- Measures listed for Field Development are applicable to the Operation and Maintenance phase (FEIR Mitigation Measure #18).

- During steam field production start-up after a power plant outage, every effort shall be made to minimize the length of time required for full venting of wells closest to receptors (FEIR Mitigation Measure #19).

- During plant shutdown, steam will be routed through the turbine bypass system to the condenser. A muffling system will be used if atmospheric discharge is needed (FEIR Mitigation Measure #20).

- Where appropriate, rock mufflers or other similar sound attenuation devices shall be installed to muffle venting operations. Baffles or other containment devices should be used to reduce cooling tower drift (FEIR Mitigation Measure #21).

- Control valve noise shall be minimized by limiting bulb pressure drop, enclosing the valves, muffling the downstream pipe, and lagging pipes adjacent to a valve. In some cases, it may be necessary to fill the pipe stands with concrete (FEIR Mitigation Measure #22).

ACOUSTICAL ENVIRONMENT: Cumulative Impacts

Impact: The cumulative effect of development in the region would be an increase in ambient-noise levels.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma and Mendocino Counties).

Facts Supporting the Finding:

The magnitude of ambient-noise level increase is dependent upon site-specific conditions; however, such noise levels would be substantially above that of similar, non-industrial areas in the region. While noise sensitive receptors are few in the region, new developments could be located in the vicinity of rural inhabited areas. Noise generation and propagation, therefore, is a potentially significant cumulative effect.

The monitoring, regulatory and operational measures for the various phases of the project listed above will reduce cumulative impacts to insignificant levels.

SOCIOECONOMICS AND PUBLIC SERVICES: Fire and Police Protection, and Medical Services

Impact: Increased human activity in the project areas during the Non-Drilling Exploration phase of the project would result in a potential increased demand for police and fire protection, and emergency services.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake Sonoma, and Mendocino Counties; California Department of Forestry).

Facts Supporting the Finding:

A potential need for emergency services from police and fire protection agencies may be generated by the increased human activity and operation of vehicles in all three proposed project areas. Brush fires may be started by sparks from off-road vehicles, through negligence of field personnel, and campfires. As the project area is classified as an extreme fire hazard area, wildfires have the potential of rapidly spreading and doing damage to the watershed and cause property and structure losses in adjacent populated areas. The local and state fire services are equipped to handle fire outbreaks throughout the project area although response times are limited by the remoteness of the area.

Exploration activities will also result in an greater number of vehicles on the roads and an increased potential for accidents to occur. Increased demands for traffic enforcement services and accident investigations could result; however, significant adverse impacts to law enforcement and emergency services are not anticipated.

The following mitigation measures requiring coordination with California Department of Forestry and implementation of vegetation management are proposed for the non-drilling exploration phase of the project in order to reduce adverse impacts on fire, police and other emergency protection to levels insignificance:

- During exploratory and construction activities, all vehicles which will travel off-road shall be equipped with CDF-approved spark arrestors. No vehicle equipped with a catalytic converter shall be stopped over or close to brush, weeds, or other combustible growth (FEIR Mitigation Measure #1).

- Personnel involved in exploratory or construction activities shall be prohibited from smoking at all times in any wildland or forest areas. In addition, personnel shall be prohibited from building campfires of any sort while in the wildland or forest areas for any purpose (FEIR Mitigation Measure #2).

- The adoption of fire safety guidelines provided by the CDF will be considered in areas subject to high and very high wildland fire hazards (FEIR Mitigation Measure #3).

- Controlled burning programs shall be supported in areas of high fire hazard to reduce the amount of combustible growth. Brush clearing around construction and development areas and geothermal facilities will be coordinated with the CDF. Clearance of highly volatile vegetation is required within 100 ft of structures in fire prone areas (FEIR Mitigation Measure #4).

- Other vegetation management techniques are intended to reduce fuel loading and include maintenance of firebreaks and fuel modification, such as thinning and irrigated buffers (FEIR Mitigation Measure #5).

- A checklist of manpower and fire-fighting equipment, including water sources shall be available in the event of a fire (FEIR Mitigation Measure #6).

SOCIOECONOMICS AND PUBLIC SERVICES: Fire and Police Protection, and Medical Services

Impact: During the Exploratory Drilling, Development, and Operation and Maintenance phases of the project increased human activity in the project areas would result in a potential increased demand for police and fire protection, and emergency services.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma, and Mendocino Counties; California Department of Forestry; California Highway Patrol).

Facts Supporting the Finding:

The increased amount of activity due to exploratory drilling and development of the leaseholds will result in an additional demand for law and traffic enforcement services. The increased number of vehicles and heavy equipment on the roads, the provision of additional roads to patrol, and potential increase in traffic accidents may require additional personnel and patrol cars to serve the project area and respond to emergencies. Also, development activities will increase the amount of hazardous and toxic material transported, and the potential for spills to occur.

Activities from drilling and lease development include the use of drilling equipment, the construction of pads, grading, and the provision of roadways. When drilling, there is the possibility of a blowout, release of and exposure to toxic gasses and steam. As with exploration activities, brush fires from drilling and construction activities, sparks from vehicles, and carelessness can occur resulting in a potentially significant adverse impact to fire protection services.

The following mitigation measures requiring areawide coordination, emergency notification, and facilities design features are proposed for the Exploratory Drilling, Development, and Operation and Maintenance phases of the project to reduce adverse impacts on fire, police and other emergency protection to levels insignificance:

- Non-Drilling Exploration fire, police protection, and medical services mitigation measures shall apply to the Exploratory Drilling, Development, and Operation and Maintenance phases of the project (FEIR Mitigation Measure #9).

- Developers of geothermal resources shall consider the use of private security forces to serve the facilities and plant operations (FEIR Mitigation Measure #9).

- Additional police personnel will be provided as needed by the respective county sheriff's office. CHP will provide patrols and personnel to provide additional traffic enforcement as needed (FEIR Mitigation Measure #26).

- Developers shall be required to participate in an area of benefit agreement for the purpose of developing a unified emergency notification and communication linking the geothermal facilities, the CDF, Lake, Mendocino, and Sonoma County Sheriff's Offices, CHP, and other agencies. This system may be integrated with the Lake County Sheriff Department central dispatch system (FEIR Mitigation Measure #27).

- Any additional personnel or equipment for fire protection will be provided by the state and local fire fighting services as needed. The developers shall pay any applicable fees to the state, county, or local fire protection services (FEIR Mitigation Measure #10).

- New buildings and facilities shall incorporate structural and design features that comply with applicable fire protection ordinances. These features will include use of fire retardant materials in construction, fire retardant plant materials in landscaping around the facilities, smoke alarms, sprinkler systems, fire extinguishers, and adequate posting of emergency exit routes and evacuation procedures (FEIR Mitigation Measure #11).

- Wellfield developers and electrical generators shall consider participation in a joint powers agreement with the respective counties as recommended by the CDF to improve fire protection within The Geysers (FEIR Mitigation Measure #28).

- The adoption of fire safety guidelines provided by the CDF will be considered in areas subject to high and very high wildland fire hazards (FEIR Mitigation Measure #29).

- Comprehensive fire protection plans shall be submitted by developers of the geothermal resources for review by local fire protection districts and the CDF. The fire protection plans shall identify the person/user responsible for ensuring that the fire protection/prevention plans are implemented (FEIR Mitigation Measure #30).
- Emergency response and evacuation plans shall include the provision of looped and double access road systems as escape routes for wildland fire emergencies. Fire access maps shall be provided to the appropriate fire districts. Access roads and bridges to geothermal facilities shall have adequate load capabilities and be wide enough to safely accommodate fully loaded fire safety equipment (FEIR Mitigation Measure #31).

- Controlled burning programs shall be supported in areas of high fire hazard to reduce the amount of combustible growth. Brush clearing around construction and development areas and geothermal facilities will be coordinated with the CDF. Clearance of highly volatile vegetation is required within 100 ft of structures in fire prone areas (FEIR Mitigation Measure #32).

- Other vegetation management techniques are intended to reduce fuel loading and include maintenance of firebreaks and fuel modification, such as thinning and irrigated buffers (FEIR Mitigation Measure #33).

- o Emergency respirator equipment shall be provided throughout geothermal facilities for use in the event of an accidental release of hazardous gas. All personnel shall be trained in the use of respirator equipment and the proper steps to be taken in the event of a gas release (FEIR Mitigation Measure #34).

- o On-site water storage for fire protection shall be provided. Storage can include tanks, ponds, pools, or wells where water is reserved for fire protection (FEIR Mitigation Measure #35).

SOCIOECONOMICS AND PUBLIC SERVICES: Water

Impact: During the Exploratory Drilling, Development, and Operation and Maintenance phases of the project increased water demand from geothermal operations could result in significant adverse impacts to already limited water resources in the area. There is also a potential over-use surface waters.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma, and Mendocino Counties; Regional Water Quality Control Board; California Department of Water Resources; local water agencies).

Facts Supporting the Finding:

During the exploratory drilling and field development phases, water will be required for the well drilling process and to facilitate dust control during construction of access roads, well pads, and plant facilities. Water required for this phase of development can be purchased from local water district suppliers and hauled to the site. Bottled water would be provided for the domestic uses of drilling and construction crews.

Power plant operations will require water for domestic uses, plant maintenance, landscaping, H_2S abatement, fire protection, and cooling tower make-up. It is anticipated that water requirements for H_2S abatement and cooling tower replacement volumes will be met using condensate from the power generation cycle and therefore, will not require and outside water source except for initial start-up procedures. Additional water demand from geothermal operations can result in adverse impacts to the current water resources. If no adequate volumes of surface or groundwater are present within the leasehold, water demand from geothermal projects in the lease will result in a significant adverse impact.

Another potentially significant adverse impact is the over-use of surface waters, notably from streams, in the operations of the power plants. While condensate waters are used for routine

plant operations, some operators in the area are diverting large volumes of water from surface streams for general operations and for additional injection into the steam wells. Surface water resources are limited and groundwater sources are not well developed. Increases in water demand generated from geothermal operations could significantly impact surface water supplies in the project areas.

Potentially significant adverse water impacts can be reduced to insignificant levels by implementing measures to regulate water supply diversion and facilitate importation of water as follows:

- Assurance for the provision of adequate water and sewer service is required prior to approval and implementation of development. All applicable water and sewer districts and departments will review water and sewer system demands for each phase of development for conformance to district design requirements and for ability to serve (FEIR Mitigation Measure #12).

- Planning for geothermal development in the leaseholds shall be provided with a with a goal of balancing local water resource needs. Utilization of local water resources should not adversely affect other nearby downstream water needs. The state, counties, and users of the leaseholds shall develop appropriate measures to protect area water rights in order to assure that long-term water needs for development and growth can be adequately met (FEIR Mitigation Measure #13).

- Water demand in areas with insufficient water resources can be partially mitigated by importing water from local suppliers (FEIR Mitigation Measure #14).

- Developers shall design and submit water and sewer plans for each proposed development project in the geothermal project areas for review and approval by the appropriate Water and Sanitation Districts of the respective counties (FEIR Mitigation Measure #15).

- The capital cost of new water distribution and sewage collection systems, pump stations, septic systems, and reservoirs to handle on-site flows will be borne by the applicant and dedicated to the appropriate Water and Sanitation District of the respective counties (FEIR Mitigation Measure #16).

- Permits for the withdrawal and diversion of water from surface streams, subterranean channels, and other bodies of water for geothermal-related uses will be obtained from the State Water Resources Control Board (SWRCB). Permit conditions include terms which require certain minimum flows during water removal as a means of protecting aquatic resources (FEIR Mitigation Measure #17).

SOCIOECONOMICS AND PUBLIC SERVICES: Wastewater

Impact: During the Exploratory Drilling, Development, and Operation and Maintenance phases of the project there will be a nominal, adverse impact associated with increased wastewater generation. The use of septic systems in the project areas will result in potential adverse impacts to water quality.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma, and Mendocino Counties; Regional Water Quality Control Board; California Department of Water Resources; local water agencies).

Facts Supporting the Finding:

Incremental impacts to domestic wastewater systems and septic systems are expected from increases in population associated with the increased workforce. The additional wastewater generated by the development and operation of geothermal facilities in the proposed leaseholds is considered an adverse impact. However, current wastewater disposal practices including collection and treatment systems and on-site systems will be sufficient to handle the additional wastewater. Exploratory drilling projects and construction sites will be provided with portable chemical toilets. Sanitary wastes are removed from the site when temporary activities are completed and disposed of at county-permitted sanitation facilities.

Sewage produced at geothermal power plants will be handled by on-site septic systems. The use of septic systems in the project areas will result in potential adverse impacts to water quality. In addition, accidental spills from condensate reinjection and sump failures may occur during operation phases.

Potentially significant adverse impacts associated with increased wastewater generation and disposal will be mitigated to insignificant levels by implementing measures to control discharges to sumps and provide package wastewater treatment systems as follows:

- The provision of a package wastewater treatment plant to accommodate large development and growth will be considered in areas where the use of septic tanks is not feasible (FEIR Mitigation Measure #39).

- Assurance for the provision of adequate water and sewer service shall be required before development is allowed to proceed (FEIR Mitigation Measure #12).

- Sanitary and hand washing facilities shall be provided at each drill site as specified by the County Health Departments (FEIR Mitigation Measure #7).

- o Required permits shall be obtained for additional discharge to sewer systems, drainage systems, sumps and injection wells, including Industrial Waste Discharge Permits issued by the Sanitation Districts and NPDES (National Pollution Discharge Elimination Permits) issued by the Regional Water Quality Control Board (FEIR Mitigation Measure #18).

- o Waste sumps and septic systems shall be properly installed and maintained to prevent leakage and spills which could contaminate surface water and groundwater sources (FEIR Mitigation Measure #19).

- o Drilling sumps shall be constructed to meet the waste discharge requirements of the Regional Water Quality Control Board (FEIR Mitigation Measure #20).

- o Contents of waste sumps shall be tested and classified to determine final waste disposal requirements. Nonhazardous solid wastes can be dried, mixed with soil and buried on-site. Hazardous wastes and potentially harmful wastes must be removed and disposed of in an approved Class I or Class II WMU (FEIR Mitigation Measure #42).

SOCIOECONOMICS AND PUBLIC SERVICE: Solid Waste

Impact: Volumes of waste generated during the Exploratory Drilling, Development, and Operation and Maintenance phases of the project be a significant adverse impact. Landfills and hazardous waste management units will be incrementally impacted.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma, and Mendocino Counties; Regional Water Quality Control Board).

Facts Supporting the Finding:

Currently, no solid waste is being produced from the project areas. Therefore, the volumes of solid waste generated during drilling, field development, and operations will be substantial and will be a significant adverse impact. Drilling, construction, and operations will produce debris and domestic wastes. Hazardous and designated solid waste will also result from a number of processes that are part of the geothermal development technology. The potential sources of solid waste include well drilling mud and cuttings, brine clarification wastes, scale, and sludge and wastes produced from hydrogen sulfide abatement.

Non-hazardous solid waste and municipal waste generated by drilling, development, and operations will be collected and disposed of at the Clearlake Highlands Landfill. The facility currently has sufficient capacity to accept the inert solid wastes expected to be generated by geothermal activities in the proposed leaseholds. However, while the volume of inert solid waste is not expected to be significant, it will incrementally shorten the life of the landfill and therefore, will be an adverse impact.

Potentially significant adverse impacts associated with increased solid waste generation and disposal will be mitigated to insignificant levels by implementing solid waste management plans and facility permitting review as follows:

- o County Solid Waste Management Plans include programs to reduce the quantities of nonhazardous solid waste being sent to landfills. These programs include source reduction, separation of recoverables, composting, and high technology resource recovery. The applicant shall implement these programs to reduce the increase in solid waste generation associated with development in the leaseholds, and will thereby extend the life of the affected disposal sites (FEIR Mitigation Measure #21).

- o Drilling sumps which are intended to be used longer than one year will require a Solid Waste Facility Permit from the Solid Waste Management Board. The Solid Waste Facilities Permit is issued by the State and requires that the sumps be designated by appropriate zoning and consistent with the General Plan (FEIR Mitigation Measure #44).

SOCIOECONOMICS AND PUBLIC SERVICES: Energy Utilities

Impact: A substantial amount of energy will be expended during the exploration, development, and operational phases of the project, resulting in a short-term adverse impacts.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma, and Mendocino Counties; California Energy Commission).

Facts Supporting the Finding:

Additional power lines to serve development and operation activities in the project areas will be installed by PG&E. Bottled propane gas and fuel oil will be supplied by local distributors. It is anticipated that exploration, development, and operation activities will expend substantial

amounts of electricity, gas, and fuel. Increased demand for electricity, gas and fuel is not expected to result in a significant impact to the current service levels, however energy consumption itself represents a loss on nonrenewable resources and is thus considered a significant adverse impact.

Potentially significant adverse impacts associated with the project related to energy consumption will be mitigated to insignificant levels by implementing measures requiring conservation and facility efficiency as follows:

- PG&E can provide assistance in selection of effective energy conservation techniques and infrastructure construction (FEIR Mitigation Measure #22).

- Development plans shall be made available to all involved utilities as they become available in order to facilitate engineering, design, and construction of improvements (FEIR Mitigation Measure #23).

- Architectural and mechanical plans for the facilities shall be carefully reviewed to verify that the lowest energy rated mechanical and electrical equipment has been specified (FEIR Mitigation Measure #24).

- Facilities will be designed for optimum energy efficiency in accordance with Energy Conservation Standards for non-residential buildings. The use of solar energy and waste heat recovery systems shall be incorporated into the design of facilities wherever feasible (FEIR Mitigation Measure #25).

SOCIOECONOMICS AND PUBLIC SERVICES: Schools

Impact: The increase in student and the need for additional classroom space will result in significant adverse impacts to local school districts, as a majority of the schools are already operating over capacity.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma, and Mendocino Counties; local school districts).

Facts Supporting the Finding:

As exploration activities are short-term, no impacts to schools are expected. Estimates of future increases or decreases in enrollment in county schools are difficult to project. The greatest increases in the workforce population will be during the exploration and development phases.

within the proposed project areas. However, future development activities are not expected to attract a significant number of new residents to the county, therefore, many of the workers who would be employed by new geothermal projects will likely be permanent residents already living in the area. Nonetheless, any increase in students and the need for additional classroom space will result in a significant adverse impact to school services since the majority of schools are already operating over-capacity.
The current development impact fee established in 1986 by passage of AB 2926 is not expected to provide sufficient mitigation payments from future geothermal projects to the school districts to offset future enrollment levels. Under this legislation, school districts are paid 25 cents per square ft of covered or enclosed industrial, i.e., geothermal space built within their jurisdiction.

Potentially significant adverse project impacts related to overcrowding in local schools will be mitigated to insignificant levels by payment of school impaction fees and through other mitigation agreements between geothermal developers and school districts as follows:

- o Developers of the proposed leaseholds shall pay required state impact fees to mitigate school impacts resulting from geothermal-related development. This standard fee will only partially mitigate school impacts (FEIR Mitigation Measure #46).

- o Developers shall also consider entering into additional mitigation agreements with the County Office of Education and the school districts to supplement state impact fees. Mitigation can include the provision of additional school sites and temporary school buildings (FEIR Mitigation Measure #47).

- o The mitigation agreements/fees shall include provision, if necessary, for school buses. The mitigation fee shall be a one-time fee for students whose families have relocated to the district since the certification of the project (FEIR Mitigation Measure #48).

SOCIOECONOMICS AND PUBLIC SERVICES: Cumulative Impacts

Impact: Specific geothermal projects could overtax public services within local subareas.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma, and Mendocino Counties; California Department of Forestry; California Highway Patrol; California Department of Water Resources; Regional Water Quality Control Board; California Energy Commission; local water agencies; local school districts).

Facts Supporting the Finding:

Attendant with an increase in population is an increased demand for public services. Though the increase in demand for public services associated with geothermal employment growth is likely to be insignificant, specific subareas in the region are plagued by certain service and capacity problems associated with small water systems, wastewater disposal, and schools. Thus, individual projects must continue to be assessed for their affect on such services.

Potentially significant adverse impacts associated with the cumulative project effect on public services will be mitigated to insignificant levels by implementing the mitigation measures described for individual services (above). On a site-specific basis, additional mitigation measures shall be prescribed as necessary to ensure cumulative project development will not result in significant adverse impacts.

AESTHETICS: Exploratory Drilling

Impact: Potentially significant adverse visual modifications to the landscape may occur.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma, and Mendocino Counties).

Facts Supporting the Finding:

Exploratory drilling requires the preparation of a pad and access roadways in addition to equipment delivery and set up of the drilling rig itself. Visual modifications from this activity will include; introduced changes in the form, line, and texture of the area from the pad site and road cutting activity, introduction of a visually obtrusive element (the drill rig and support vehicles), changes in the character of the landscape from undeveloped to partially developed and/or disturbed which will compete with surrounding undeveloped/rural settings, and, changes in viewer expectations depending on where the exploratory drilling is located (whether it is within a sensitive viewshed).

In addition, most drill rigs operate on a 24-hour basis, thus requiring night lighting. Steam venting out during this operation combined with lighting may be visible at night.

The following mitigation measures relating to pad and facilities design and location will be implemented to reduce visual impacts during exploratory drilling to insignificant levels:

- Pads, roads, pipelines, plants, and transmission facilities shall be designed so as to present the least visual intrusion on views from popular use areas. Consideration shall be given to the facility's distance from potential viewers during the design process (FEIR Mitigation Measure #1).

- The use of local rock types for road and pad surfacing material will help minimize color contrast between engineered and natural land forms (FEIR Mitigation Measure #2).

AESTHETICS: Full Field Development

Impact: Potentially significant adverse visual modifications to the landscape may occur.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma, and Mendocino Counties).

Facts Supporting the Finding:

Lease development will involve the combination of visual impacts similar to those resulting from well drilling with a combination of other visual elements. More activity will be visible during construction than at any other time. Many trucks will be bringing materials into the leasehold area, significantly increasing activity within and through nearby local communities. Also associated with lease development is the construction of power transmission facilities composed of high-voltage lattice-type transmission towers. These will be placed both on-site and off-site to make necessary inter-ties to an existing PG&E system.

Temporary night lighting will be placed on drill rigs and possibly other construction areas. Permanent low-level lighting will be placed on structures and pads which will show as pin points of light from a distance. Illumination may be increased by steam from the well pads as well as the plants at night.

These changes have the potential to result in a significant visual impact which is dependent on viewer sensitivity, proximity and relative scale from the lease development activity. The following mitigation measures relating to facilities design will be implemented to reduce these aesthetic impacts to insignificant levels:

- Exploratory Drilling mitigation measures shall be applicable to the Operation and Maintenance Field Development phase (FEIR Mitigation Measure #3).

- On visual edges such as ridgelines, construction of facilities shall maintain a low profile design. A low profile design for pipelines shall also be incorporated. All pads, roads, pipelines, and transmission towers, as well as buildings, shall utilize existing vegetation and topography to the maximum extent possible for visual screening. Pipelines and roads shall lie parallel to existing terrain contours to minimize visual breaks in the landscape. In areas of visual sensitivity, visual analysis shall include the use of vertical versus horizontal pipeline expansion loops to minimize visibility (FEIR Mitigation Measure #4).

- Plants, control buildings, maintenance buildings, pump stations, and other structures shall be constructed and colored in natural browns and shades of greens to blend into the surrounding terrain (FEIR Mitigation Measure #5).

- Pipelines shall be wrapped with green or light brownish taping to also blend in with surrounding terrain. It should be determined which color is appropriate depending on the adjacent shrubbery. Taping on pipelines shall continue to be maintained during operation to prevent reflections and glaring off of the pipelines. (In some areas of existing developments the taping has worn off and extreme glaring is experienced off of the silvery-metal of the pipelines) (FEIR Mitigation Measure #6).

- Transmission towers shall also be etched and colored so as not to create glare conditions and to blend into the surrounding environment (FEIR Mitigation Measure #7).

- Vegetation plans and vegetation maintenance plans shall be required and approved prior to construction to minimize, reduce, or eliminate impacts from construction activity or drilling operations. In particular, these plans shall address cut and fill work required for construction of pads, roads, and related plant facilities and the revegetation of these areas. The vegetation maintenance plan shall focus on the permit holder being responsible for planting and maintaining native trees and vegetation along the revegetated areas (FEIR Mitigation Measure #8).

- Lighting plans shall be approved prior to construction and shall include that lighting be shielded or directed away from any sensitive receptors including residences, public roadways and any other public use facilities (FEIR Mitigation Measure #9).

- Cut and fill areas shall be revegetated to reduce visual contrast with the surrounding area (FEIR Mitigation Measure #10).

- In Lake County, new high voltage transmission facilities shall not be sited along a foreground view of major resorts or wineries, potential state and country scenic highways or communities as designated in the Lake County General Plan, unless no feasible alternatives exist. In situations where no feasible alternatives exist, undergrounding or other visual mitigation measures shall be imposed (FEIR Mitigation Measure #).

AESTHETICS: Operations and Maintenance

Impact: Potentially significant adverse visual modifications to the landscape may occur.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma, and Mendocino Counties).

Facts Supporting the Finding:

Impacts from operation and maintenance of facilities will be the same as those for listed above for lease development with the exception of the construction activity (except for additional well drilling). Night lighting for structures, well pads, access road entrances, and other areas may create pinpoints of light as well as the potential for illumination from steam and foggy conditions.
These changes have the potential to result in a significant visual impact which is dependent on viewer sensitivity, proximity and relative scale.

Mitigation measures adopted for the Non-Drilling Exploration and Exploratory Drilling phases of the project shall continue to be implemented during the Operations and Maintenance phase, thereby reducing any potentially significant adverse aesthetic impacts to insignificant levels.

AESTHETICS: Abandonment

Impact: Removal of geothermal materials will leave visual scars such former facility and drill pads, and abandoned roadways. modifications to the landscape may occur.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma, and Mendocino Counties).

Facts Supporting the Finding:

During actual abandonment, it is assumed that all power plant building structures, pipelines, unused transmission towers and construction debris and surplus materials will be removed from

the sites. Once these materials are removed, visual scars will consist of the areas used for drilling pads, plant and ancillary facility pads (i.e., maintenance buildings), and roadways.

If site restoration occurs in accordance with proper revegetation guidelines, including recontouring of pads to blend in with the existing terrain, then any potential impacts resulting from operations activities and subsequent abandonment will be substantially reduced. In addition, the following mitigation measures relating to specific revegetation requirements shall be implemented to help reduce post-abandonment aesthetic impacts to insignificant levels:

- o Vegetation plans addressing abandonment should also be approved in advance of any final project approvals and should be in accordance with requirements addressed for biological resources (FEIR Mitigation Measure #12).

- o Cut and fill areas will be revegetated to reduce visual contrast with the surrounding area (FEIR Mitigation Measure #13).

AESTHETICS: Cumulative Impacts

Impact: Land use conversion necessary for the construction of access roads, well sites, and power plants has the potential to significantly impact scenic quality in the project area.

Finding: A) Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final EIR.

B) Such changes or alterations are within the responsibility or jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by other such agencies or can or should be adopted by other such agencies (Lake, Sonoma, and Mendocino Counties).

Facts Supporting the Finding:

Expansion of geothermal development, could include 4 to 8 new plants, and will have the potential to change to character of the viewshed in the project area. Changes in a viewshed could include the addition of incongruous features such as industrial structures, grading cuts, vegetation removal, and increased human activity and traffic flow.

The combination of new plants and new residential growth will have the potential to begin to change the character of the area from rural and remote to one of slightly more development. It is unlikely however, that the overall character will change significantly due to other constraints in land development, most notably infrastructure availability.

Siting considerations shall include use of hills and terrain to naturally screen elements from general viewsheds, sensitive placement of man-made structures, use of compatible coloration

restoration of landform and vegetation, and respect for scenic corridor viewsheds. Though it will not be possible to completely mitigate cumulative visual impacts, mitigation will reduce the impact to acceptable levels.

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
SYSTEMS SAFETY				
Phase 1 - Non-Drilling Exploration Activities				
The proposed leasehold is generally undeveloped with the exception of some roadways.	Offroad vehicle operation increases possibility of fires. Any wildland brush or forest fire would constitute a significant impact.	All vehicles shall be equipped with CDF-approved spark arrestors. Campfires and smoking shall be prohibited during exploratory activities.	- Applicant/ Developer	Reduced to insignificant
Phase 2 - Exploratory Drilling				
No active geothermal activities occur in any of the three project areas.	Potential exists for blowout of well. A blowout could constitute a significant impact because of the possibility of injury or death to site personnel.	Blowout Prevention Equipment shall be installed in all wells.	- Applicant/ Developer	Reduced to insignificant
Phase 3- Full Field Development				
The proposed leasehold is generally undeveloped with the exception of some roadways.	During construction, potential exists to start a significant brush or forest fire. Any wildland brush or forest fire would constitute a significant impact.	All vehicles shall be equipped with CDF-approved spark arrestors. Development areas shall be cleared of combustible material and a fire extinguisher shall be kept on-site at all times.	- Applicant/ Developer - CDF	Reduced to insignificant
Phase 4- Operation and Maintenance				
No active geothermal activities occur in any of the three project areas. Roadways are used for transportation of hazardous material such as fuel, solvents, and drilling muds.	Accidents may occur during maintenance, esp. welding-initiated fires. Accidents may occur with the handling of hazardous materials and hazardous wastes. Waste haulers must typically use heavy trucks and negotiate steep, narrow, or winding roads to transport wastes from remote well site and geothermal facilities. The impacts associated with hazardous materials and wastes depends on the volume generated.	Development areas shall be cleared of combustible material and a fire extinguisher shall be kept on-site at all times. Hazardous wastes shall be packaged, manifested and transported according to applicable state and federal regulations. A safety and emergency response program shall be developed including regular vehicle inspections by Applicant in accordance to OSHA regulations. On-site minimization of hazardous wastes shall be employed to maximum extent possible.	- Applicant/ Developer - CDF - Applicant/ Developer - Planning Dept. - CDHS - OSHA - SLC	Reduced to insignificant The potential for accidental release or improper disposal of hazardous wastes is considered a significant adverse impact.

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Phase 5 - Abandonment				
The proposed leasehold is generally undeveloped with the exception of some roadways.	Abandonment activities will involve much work similar to construction, e.g., welding and potential exists to start a fire. Hazardous wastes may accumulate as equipment, pumps, sumps, etc. are dismantled.	Development areas shall be cleared of combustible material and a fire extinguisher shall be kept on-site at all times. A reclamation plan shall be submitted to Planning Department and well abandonment shall occur as required by the Division of Oil and Gas and SLC.	- Applicant/ Developer - Applicant/ Developer - DOG - SLC	Insignificant
Cumulative Impacts and Mitigations				
	Increase in incidence of wildland brush or forest fire. Increase amount of hazardous gases. Generation of significant quantities of known hazardous wastes which must be contained, handled, and disposed of in accordance with state and federal law.	All vehicles shall be equipped with CDF-approved spark arrestors. Development area shall be cleared of combustible material and a fire extinguisher shall be kept on-site at all times. It is recommended that geothermal waste facilities be located in the Geysers area. Technological changes in operations has great potential to reduce hazardous waste disposal requirements. A Risk Management and Prevention Program for acutely hazardous materials shall be prepared as required by State law.	- Applicant/ Developer - Applicant/ Developer - DOG - SLC	Reduced to insignificant The potential for accidental release or improper disposal of hazardous wastes is considered a significant adverse impact.
LAND USE				
Phase 1 - Non-Drilling Exploration Activities				
The Geysers-Calistoga KGRA is rural in character and sparsely populated due mainly to the characteristic steepness and ruggedness of the terrain, fire hazard potential, road accessibility, and lack of public services.	No land use disturbance will result from non-drilling exploration activity.	No mitigation is required.	- Applicant/ Developer	Reduced to insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Phase 2 - Exploratory Drilling				
The Geysers-Calistoga KGRA is rural in character and sparsely populated due mainly to the characteristic steepness and ruggedness of the terrain, fire hazard potential, road accessibility, and lack of public services.	Land transformation will occur as a result of access roadway construction and pad development.	Development shall proceed in accordance with all state and local permit requirements. Measures to minimize land disturbance to be implemented include limitation on cut and fill activity, sharing of roadways, etc. All disturbed areas will be revegetated as soon as possible.	- Applicant/ Developer	Reduced to insignificant
Phase 3 - Full Field Development				
The Geysers-Calistoga KGRA is rural in character and sparsely populated due mainly to the characteristic steepness and ruggedness of the terrain, fire hazard potential, road accessibility, and lack of public services.	Land transformation will occur as a result of access roadway construction and pad development.	Development shall proceed in accordance with all state and local permit requirements. Measures to minimize land disturbance to be implemented include limitation on cut and fill activity, sharing of roadways, etc. All disturbed areas will be revegetated as soon as possible.	- Applicant/ Developer	Reduced to insignificant
Phase 4 - Operation and Maintenance				
The Geysers-Calistoga KGRA is rural in character and sparsely populated due mainly to the characteristic steepness and ruggedness of the terrain, fire hazard potential, road accessibility, and lack of public services.	Land transformation will occur as a result of access roadway construction and pad development.	Measures to mitigate potential impacts to residential users include adherence to buffering requirements set forth through county guidelines for noise, visual affects, air quality, and other areas.	- Applicant/ Developer	Reduced to insignificant
Phase 5 - Abandonment				
The Geysers-Calistoga KGRA is rural in character and sparsely populated due mainly to the characteristic steepness and ruggedness of the terrain, fire hazard potential, road accessibility, and lack of public services.	Proper site restoration and revegetation and time will allow areas to recover from development scars.	Revegetation plan shall be developed by a qualified biologist, reviewed by Planning and monitored to ensure revegetation is successful.	- Applicant/ Developer	Reduced to insignificant
Cumulative Impacts and Mitigations				
The Geysers-Calistoga KGRA is rural in character and sparsely populated due mainly to the characteristic steepness and ruggedness of the terrain, fire hazard potential, road accessibility, and lack of public services.	Potential land use conflict would probably occur in the northern part of Lake County in Project Area 2. This area is where development is likely to occur and is near inhabited areas.	The mitigation measures described above will reduce all of the significant adverse impacts regarding land use to levels considered acceptable and therefore insignificant.	- Applicant/ Developer	Reduced to insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
PHYSIOGRAPHY AND GEOLOGY				
Phase 1 - Non Drilling Exploration Activities				
The area of the Geysers KGRA is located in the physiographic province known as the Coast ranges. The physical setting for the project leasing area is the very steep, rugged terrain surrounding the Mayacmas Mountains.	Gravity surveys, magnetometer surveys, seismic surveys, resistivity surveys, aerial photo and geophysical reconnaissance, drilling of shallow heat gradient well, geochemical studies, geologic mapping, and field surveys may occur but impacts are minimal.	A plan of exploration shall be prepared and submitted prior to commencement of any exploration activities.	- Applicant/ Developer - DOG - SLC	Reduced to insignificant
Phase 2 - Exploratory Drilling				
The area of the Geysers KGRA is located in the physiographic province known as the Coast ranges. The physical setting for the project leasing area is the very steep, rugged terrain surrounding the Mayacmas Mountains.	Impacts from exploratory drilling include erosion from grading, damage from spills of lubricating oils and greases, damage from accidental discharge of drilling fluids, overflow of fluids in sump pit, and uncontrolled blowouts. Most of the above activities could cause hazardous materials to be discharged.	Exploratory drilling plan shall include measures to minimize listed impacts. Pads shall be compacted to a minimum of 90 percent relative compaction, filled slope banks should not exceed a gradient of 1.5:1, toes of fills should be stabilized with rock and gravel or keyed into stable soil, etc.	- Applicant/ Developer	Reduced to insignificant
Phase 3 - Full Field Development				
The area of the Geysers KGRA is located in the physiographic province known as the Coast ranges. The physical setting for the project leasing area is the very steep, rugged terrain surrounding the Mayacmas Mountains.	Impacts from development include erosion from grading, damage from spills of lubricating oils and greases, damage from accidental discharge of drilling fluids, overflow of fluids in sump pit, and uncontrolled blowouts. Most of the above activities could cause hazardous materials to be discharged. Impact is multiplied by the number of wells drilled. Varied impacts will also occur from construction of a steam gathering system and transmission facilities.	Drilling plan shall include measures to minimize listed impacts. Pads shall be compacted to a minimum of 90 percent relative compaction, filled slope banks should not exceed a gradient of 1.5:1, toes of fills should be stabilized with rock and gravel or keyed into stable soil, etc.	- Applicant/ Developer	Reduced to insignificant
Phase 4 - Operation and Maintenance				
The area of the Geysers KGRA is located in the physiographic province known as the Coast ranges. The physical setting for the project leasing area is the very steep, rugged terrain surrounding the Mayacmas Mountains.	Little additional surface disturbance will occur. Impacts are limited to possible occurrences ranging from failure of previous work to regional geotechnical or resource events. Possible but unlikely impacts include damaging settlements and/or failure of the earthwork, and failure or leakage of surface pits constructed.	A maintenance plan shall be developed by Applicant and reviewed by Planning. Maintenance activities shall occur on a regular basis.	- Applicant/ Developer - Planning Department	Reduced to insignificant
a. surface rupture				
There are five large faults and numerous smaller fractures mapped in the area of the leases. They are considered very old and inactive.	It is believed to be improbable that a surface rupture would occur as a result of an active fault.	No mitigation measures are proposed.		Insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
b. seismic activity				
There are five large faults and numerous smaller fractures mapped in the area of the leases. They are considered very old and inactive. No linear arrangements of clustering of epicenters occurs in the lease areas.	Potential future fault movement is low, but because of the numerous faults in California, periodic ground shaking is likely.	Proper engineering design should eliminate the impact of earthquake induced damage to the physical facilities.	- Applicant/ Developer	Reduced to insignificant
c. landslides				
Over 200 landslides have been identified in the project areas but only a few could be classified as being active. The majority of the area is currently very stable.	During the course of operational life, a landslide is probable, however, the impact of these slides can be made negligible with proper planning and location of operation and facilities. Addition of large volumes of fluids into the surrounding soils could trigger landslides.	No pad construction shall occur on steep slopes, at the base of toe of steep slopes, or known slides. All fills should be properly drained. Updated mapping of existing and potential landslide areas shall occur and these areas shall be avoided.	- Applicant/ Developer	Reduced to insignificant
d. liquefaction				
Bedrock of Project Lease Areas No. 1 and 2 is composed of Jurassic to Cretaceous age rocks of the Franciscan Complex. The bedrock geology in Project Lease Area No. 3 is composed of volcanic flows and air-borne volcanics such as ash, etc.	Sands and gravel of the alluvial and colluvial deposits, landslide debris, terrace deposits, and some lake deposits all have potential for liquefaction. These type of deposits have a somewhat restricted distribution over the lease area.	If these deposits are avoided, it is improbable that any damages could result.	- Applicant/ Developer	Reduced to insignificant
e. flooding				
Rainfall is highly variable in the lease area. Most of the drainages are very narrow and incised.	Probability of flooding in the stream valleys is high.	Avoidance of building in these water courses will make flooding improbable.	- Applicant/ Developer	Reduced to insignificant
f. cavity collapse				
Review of maps and aerial photos do not indicate any evidence of natural cavities or underground workings in the lease area.	It is improbable that cavity collapse would occur in the area.	No mitigations measures are suggested.		Insignificant
g. volcanism				
There are known active volcanoes in the area. The closest potential area in about 24 km (15 miles) away in the area north of Lower Lake.	The potential for surface lava flows reaching the area and doing damage is considered extremely remote. The major impact from eruption would be ash fall.	No mitigation measures are suggested.		Insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Geothermal Resource Utilization				
Resource Depletion				
Without injection, a model indicates that within 15 years, at the current rate of production the reservoir (excluding isolated unproven resource cells) would be depleted.	A negative impact of increased geothermal development of new fields is the increased rate of depletion.	Conservation of the resource during energy production is the most effective mitigation.	- Applicant/ Developer	Significant
		Operational measures such as cycling, load following, and puffing conserve the resource by delivering loads in a cyclic manner consistent with demand.	- Applicant/ Developer	
		Binary recovery equipment installment would increase overall plant efficiency.	- Applicant/ Developer	
	The depletion of use of an operator's underlying field at the expense of an adjacent operator is a very difficult impact to assess.	Mitigation measures cannot be presented until further knowledge is developed about the mechanics (i.e., exchange of heat and fluids) between the cells in the reservoir.		
Reservoir Injection				
The same model as mentioned above, indicates that by reinjecting 30 percent of the mass produced, energy recovery would increase by 35 percent.	A negative impact from injection is local quenching of the formation and/or thermal breakthrough of the injectate into the zone where the production well takes up steam. Quenching causes the steam drawn off to be too wet and reduces the efficiency of power generation.	Mitigation measures to prevent debilitation of the resource would be left as a self imposed requirement for the operator.	- Applicant/ Developer	Insignificant
	The construction of impoundments on any of the local water courses to be used for injection would have substantial impacts.	Mitigation would be imposed through the county flood control permitting process.	- Applicant/ Developer	Significant
	Operator could also be employing recharge or reservoir stimulation activities which may debilitate the production in an adjacent field.	Mitigation would be imposed through application of water quality standards set by county on injectate.	- Applicant/ Developer	Insignificant
Induced Ground Displacement				
A secondary impact of drawing off the resource is surface displacement caused by relief of subsurface pressure. The settlement may then induce seismicity.	Localized settlement in the mountainous Geysers area may have minor impacts on roadways and utilities and accelerate top soil creep on steep slopes.	Subsidence and induced seismic activities are mitigatible by recharging the reservoir by injection. Localized displacement has little impact and requires little mitigation.	- Applicant/ Developer	Insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Induced Seismicity Micro earthquake activity in the Geysers area has been directly attributed to the withdrawal of steam for energy production. **Landform Modification** The area of the Geysers KGRA is located in the physiographic province known as the Coast ranges. The physical setting for the project leasing area is the very steep, rugged terrain surrounding the Mayacmas Mountains.	Current seismicity is of low magnitude and has unmeasurable effects on the production facilities. However, tremors propagating through the neighboring communities are a nuisance causing residents concern. Physical results of landform modification, i.e., increased erosion and sedimentation. These occur on a site-specific basis and it is not expected that these separate impacts would be coincidental and cause relative cumulative impacts.	A sustained monitoring program is needed to measure vertical and horizontal displacements in order to assess the seismic risks in the region, and further research on reservoir is needed. No geotechnical engineering measures nor protective measures, in addition to those identified for site-specific impacts, can be prescribed for application on a cumulative basis.	- Applicant/ Developer	Insignificant
Phase 5 - Abandonment				
	Impacts are similar to those during development phase. Topography will be altered, drainage and water run off patterns will be modified and abandonment activities will expose bare ground which will result in increased erosion.	Site shall be cleared of all unnecessary materials and restored insofar as practical. Sumps and test ponds shall be filled and covered. Erosion control measures shall be in place. Sump fluids shall be chemically analyzed for hazardous materials, biologically sensitive materials, and heavy metal and acids.	- Applicant/ Developer	Reduced to insignificant
Cumulative Impacts and Mitigations				
Geothermal Resource Utilization Currently, no active geothermal activities occur in the project area but facilities do presently exist over known steam fields.	The cumulative impact is an overall decline in geothermal resource potential in the Geysers which is presently theorized to be accelerated due to lack of injection of sufficient quantities of fluids to offset depletion.	Implementation of area-wide injection is the only mitigation to conserve the resource. However, because of the lack of sufficient sources of water, this measure is considered to have low feasibility.	- Applicant/ Developer	Reduced to insignificant with the implementation of a feasible injection program
SURFACE AND GROUND WATER HYDROLOGY				
Phase 1 - Non-Drilling Exploration Activities				
The Geysers region is surficially typified by steep canyons, high ridges, erodible soil, thin alluvial fillings, heavy rains, and high runoff. The study area encompasses portions of four watershed areas.	Some significant short-term impacts are increased erosion and sedimentation problems in nearby streams. Sedimentation and turbidity affect fish and wildlife habitats and can endanger water supplies.	Plans of exploration shall detail methods to prevent erosion into creeks and streams. Many impacts on the surface water can be reduced or eliminated by proper planning and siting.	- Applicant/ Developer - DOG	Reduced to insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Phase 2 - Exploratory Drilling				
The Geysers region is surficially typified by steep canyons, high ridges, erodible soil, thin alluvial fillings, heavy rains, and high runoff. The study area encompasses portions of four watershed areas.	Construction activities will cause impacts that will be more short-term in nature rather than permanent. Significant impacts include removal of vegetation, increased sediment load in streams, and increased fines in lakes, etc. The greatest potential problem is the spillage of drilling muds or fluids which could create significant adverse water quality conditions deleterious to most aquatic organisms.	Measures to reduce erosion and sedimentation include damming cut and fill areas with hay bales, compacting pads to a minimum of 90 percent compaction, and finding slope banks no more than a gradient of 1.5:1. Sumps shall be properly lined and monitored. Sumps shall always maintain at least 3 feet of freeboard to accommodate blow out, excess formation fluids or heavy rains and proper berms and dikes shall be strategically placed to guard against spills.	- Applicant/ Developer	Reduced to insignificant
Phase 3 - Full Field Development				
Development of a lease into production status involves drilling additional wells, building a generation plant, constructing pipelines, feeder transmission lines, and providing required access.	Impacts of development are the same as exploratory drilling as listed above except the magnitude of potential construction projects is much greater which increases the potential or frequency of impacts.	Mitigations are the same for as for the exploratory phase listed above. Additional mitigations include - Applicant shall obtain by right or purchase all water used in drilling process or dust control. Springs shall be monitored and floodplain management practices shall be implemented.	- Applicant/ Developer	Reduced to insignificant
Phase 4 - Operation and Maintenance				
The Geysers region is surficially typified by steep canyons, high ridges, erodible soil, thin alluvial fillings, heavy rains, and high runoff. The study area encompasses portions of four watershed areas.	The development of water resources on area streams would be a significant adverse impact. An important significant impact is the potential of contamination of surface water via liquid wastes. Cooling tower drift emissions may enter local streams under times of excess rainfall causing potentially significant water quality impacts. The extent of degradation from spills depends on the composition and quantity of the spill.	Applicant shall obtain by right or purchase all water used in drilling process or dust control. All waste must be disposed of in compliance with existing federal state and county regulations. No waste shall be allowed to enter any streams, creek or other body of water. Sumps shall be properly lined and monitored. Sumps shall always maintain at least 3 feet of freeboard to accommodate blow out, excess formation fluids or heavy rains and proper berms and dikes shall be strategically placed to guard against spills.	- Applicant/ Developer	Reduced to insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Groundwater Impacts				
There is no significant development of groundwater in the immediate area of the leases. The lease areas in general are not to be considered as having a high potential for developing significant amounts of groundwater.	Potential for significant impact to the limited groundwater resources during drilling and operation phases may occur from accidental seepage of drilling or other stored fluids, spillage of oils, etc, and migration of formation fluids up and into the groundwater zones as a result of faulty cement jobs and completion practices.	Primary protection of the groundwater is to be accomplished by proper lining of all sumps and monitoring same on a monthly basis.	- Applicant/ Developer	Reduced to insignificant
Phase 5- Abandonment				
The Geysers region is surficially typified by steep canyons, high ridges, erodible soil, thin alluvial fillings, heavy rains, and high runoff. The study area encompasses portions of four watershed areas.	The impacts to the lease area from abandonment will be similar to impacts listed above for exploratory drilling. The impacts will be transitory in nature and very short lived.	Mitigations are similar to those listed above under exploratory drilling. Additional mitigation includes the removal of all unnecessary material, the filling and covering of test ponds, and the restoration of the premises to a near natural state.	- Applicant/ Developer	Reduced to insignificant
Cumulative Impacts and Mitigations				
	The potential for significant hydrologic impacts is high for a short duration during and shortly after construction of future geothermal development sites.	Applicants shall implement above listed mitigation and participate in an area-wide monitoring program.	- Applicant/ Developer	Reduced to insignificant
	Any significant diversion of surface water for reservoir injection would significantly diminish water quality and aquatic habitats. Watershed values and water quality can be significantly affected from alteration of natural runoff patterns.	The implementation of an areawide reservoir injection program would require a corresponding program to develop local surface and/or groundwater sources to support injection. Advance in technology could produce greater steam efficiency and greater condensate for injection.	- Applicant/ Developer	Reduced to insignificant with the implementation of a feasible injection program
	The potential exists for spills of hazardous waste material.	All waste must be disposed of in compliance with existing federal state and county regulations. No waste shall be allowed to enter any streams, creeks, or other body of water.	- Applicant/ Developer	The potential for accidental release or improper disposal of hazardous wastes is considered a significant adverse impact.

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
BIOLOGICAL RESOURCES				
Phase 1 - Non-Drilling Exploratory Activities				
Vegetation				
The project region is a highly diverse mosaic of shrub, woodland, riparian, and grassland communities. Of particular importance for rare plant species is the presence of serpentine soils and rocky outcrops within the project area.	Removal of vegetation for access and trampling of localized areas by workers will impact area. Potentially significant impacts occur if habitat contains or is suitable for rare plant species. Probability of significant impacts is higher for Project Areas 2 and 3 where sensitive plant species are known to occur.	A site-specific plant survey and rare plant survey shall be conducted by a qualified biologist in accordance with California Native Plant Society guidelines as recommended by the California Department of Fish and Game.	- Applicant/ Developer - CNPS - CDFG	Reduced to insignificant
Wildlife				
The high diversity of vegetation communities present in the leasehold areas is associated with a high diversity of wildlife taxa. The areas are actually or potentially occupied by 33 species of amphibians and reptiles, 97 species of birds as residents or seasonal visitors, and 34 species of mammals.	The overall impacts are minimal on wildlife for all three properties. Habitat will not be significantly altered and activities are of short duration as not to produce a harmful disruption of wildlife activities.	A survey shall be conducted by a qualified wildlife biologist to assure no active carnivore dens are present. If an occupied den is found, wildlife biologist shall insure protection of occupant and may relocate the den if necessary.	- Applicant/ Developer	Reduced to insignificant
Aquatic Resources				
There are two major drainage systems within the project area, and several major creeks which drain into Big Sulphur Creek.	Impacts could result if these activities increased sedimentation into the streams.	Measures to prevent erosion and sedimentation shall be included in the plan of exploration.	- Applicant/ Developer - DOG	Reduced to insignificant
Phase 2 - Exploratory Drilling				
Vegetation				
The project region is a highly diverse mosaic of shrub, woodland, riparian, and grassland communities. Of particular importance for rare plant species is the presence of serpentine soils and rocky outcrops within the project area.	Removal of vegetation and potential for removal of sensitive species during access road construction, road widening, clearing of the drilling pad site, disposal of soil or debris, and construction of the drilling pad sump. Accidental spillage of hot fluids may also damage vegetation on a local basis. Project Area 2 and 3 have the highest probability of significant individual and cumulative impacts from drilling operations.	Removal of or injury to sensitive plant species shall be avoided. If removal of injury to sensitive plant population occurs, a management plan shall be developed and implemented immediately. Mitigation measures to prevent spills are listed under all phases of Surface Water and Groundwater Hydrology section.	- Applicant/ Developer - Applicant/ Developer	Reduced to insignificant Reduced to insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Wildlife				
The high diversity of vegetation communities present in the leasehold areas is associated with a high diversity of wildlife taxa. The areas are actually or potentially occupied by 33 species of amphibians and reptiles, 97 species of birds as residents or seasonal visitors, and 34 species of mammals.	Considerable local modification of wildlife habitat and habitat removal will result, especially during drilling pad and sump construction. Impact will be greatest in Project Area 3 where yellow pine forests would be removed. Important den sites for larger carnivores may be lost. Wildlife activities may increase substantially in the area since the drilling sump will potentially increase the amount of available water.	A survey shall be conducted by a qualified wildlife biologist to evaluate habitats and assure no active carnivore dens are present. If an occupied den is found, wildlife biologist shall insure protection of occupant and may relocate the den if necessary.	- Applicant/ Developer - Potentially beneficial	Reduced to insignificant
Aquatic Resources				
There are two major drainage systems within the project area, and several major creeks which drain into Big Sulphur Creek.	Construction activities would have potential to cause increased sedimentation and erosion into creek drainages. There is a chance for potentially toxic materials to be spilled and eventually be washed into the streams.	Cut and fills shall be dammed with sandbags during construction to prevent sediment transport. Measures as discussed previously will reduce chances for spills. No waste shall be allowed to enter any streams, creeks, or other body of water.	- Applicant/ Developer - Applicant/ Developer	Reduced to insignificant Reduced to insignificant
Phase 3 - Full Field Development				
Vegetation				
The project region is a highly diverse mosaic of shrub, woodland, riparian, and grassland communities. Of particular importance for rare plant species is the presence of serpentine soils and rocky outcrops within the project area.	Approximately 45 to 90 hectares (100 to 200 acres) of vegetation would be cleared for each power plant site. Vegetation may be injured from accidental spills or other gaseous emissions. Removal of vegetation in a sensitive habitat such as serpentine grassland would be considered highly significant.	A revegetation and landscaping plan shall be developed which utilizes native plant species. Measures as discussed previously will reduce chances for spills. No waste shall be allowed to enter any streams, creek or other body of water. Areas of sensitive habitat shall be avoided.	- Applicant/ Developer - Applicant/ Developer - Applicant/ Developer	Reduced to insignificant Reduced to insignificant Reduced to insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Wildlife				
The high diversity of vegetation communities present in the leasehold areas is associated with a high diversity of wildlife taxa. The areas are actually or potentially occupied by 33 species of amphibians and reptiles, 97 species of birds as residents or seasonal visitors, and 34 species of mammals.	Considerable local modification of wildlife habitat will result, especially during drilling pad and sump construction. Impact will be greatest in Project Area 3 where yellow pine forests would be removed. Important den sites for larger carnivores may be lost. More secretive or disturbance-sensitive species such as gray foxes may be permanently displaced by development activities. Fossorial mammals and reptiles will be displaced or	A survey shall be conducted by a qualified wildlife biologist to evaluate habitats and to assure no active carnivore dens are present. If an occupied den is found, wildlife biologist shall insure protection of occupant and may relocate the den if necessary.	- Applicant/ Developer	Reduced to insignificant
Aquatic Resources				
There are two major drainage systems within the project area, and several major creeks which drain into Big Sulphur Creek.	Construction activities have potential to significantly increase sedimentation and erosion into creek drainages. Potentially toxic materials may be spilled and eventually be washed into the streams and cause lethal or sublethal effects on aquatic organisms.	Cut and fills shall be dammed with sandbags during construction to prevent sediment transport. Measures as discussed previously will reduce chances for spills. No waste shall be allowed to enter any streams, creeks, or other body of water.	- Applicant/ Developer - Applicant/ Developer	Reduced to insignificant Reduced to insignificant
Phase 4 - Operation and Maintenance				
Vegetation				
The project region is a highly diverse mosaic of shrub, woodland, riparian, and grassland communities. Of particular importance for rare plant species is the presence of serpentine soils and rocky outcrops within the project area.	Impacts during operation and maintenance are not expected beyond those previously discussed. Steam emissions and accidental spills are potential impacts.	 Measures as discussed previously will reduce chances for spills.	 - Applicant/ Developer	Insignificant Reduced to insignificant
Wildlife				
The high diversity of vegetation communities present in the leasehold areas is associated with a high diversity of wildlife taxa. The areas are actually or potentially occupied by 33 species of amphibians and reptiles, 97 species of birds as residents or seasonal visitors, and 34 species of mammals.	The continued operation of the steam plant facilities will not impact additional habitat beyond that lost in development.			Insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Aquatic Resources				
There are two major drainage systems within the project area, and several major creeks which drain into Big Sulphur Creek.	This phase would have less potential for major inputs of sediment since construction will have been completed; however, reconstruction and maintenance may increase erosion in the streams.	Cut and fills shall be dammed with sandbags during construction to prevent sediment transport.	- Applicant/ Developer	Reduced to insignificant
	Accidental spills and steam emissions are also a potential significant impact.	Measures as discussed previously will reduce chances for spills. No waste shall be allowed to enter any streams, creeks, or other body of water.	- Applicant/ Developer	Reduced to insignificant
Phase 3 - Abandonment				
Vegetation				
The project region is a highly diverse mosaic of shrub, woodland, riparian, and grassland communities. Of particular importance for rare plant species is the presence of serpentine soils and rocky outcrops within the project area.	Impacts include contamination and mortality of the surrounding vegetation due to migration of toxic fluids.	Measures as discussed previously will reduce chances for spills and seepage of toxic materials.	- Applicant/ Developer	Reduced to insignificant
Wildlife				
The high diversity of vegetation communities present in the leasehold areas is associated with a high diversity of wildlife taxa. The areas are actually or potentially occupied by 33 species of amphibians and reptiles, 97 species of birds as residents or seasonal visitors, and 34 species of mammals.	Re-establishment of wildlife in the area of an abandoned well will depend partly on the patterns of revegetation.	A revegetation plan shall be developed which utilizes native plant species and encourages wildlife uses.	- Applicant/ Developer	Reduced to insignificant
Aquatic Resources				
There are two major drainage systems within the project area, and several major creeks which drain into Big Sulphur Creek.	Activities associated with well abandonment has the potential to accelerate sedimentation into streams. Toxic fluids left in the area could wash into the streams.	Cut and fills shall be dammed with sandbags during abandonment to prevent sediment transport. Measures as discussed previously will reduce chances for spills and seepage of toxic materials.	- Applicant/ Developer	Reduced to insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Cumulative Impacts and Mitigations - Vegetation and Wildlife				
	Removal of additional acreages of habitat within The Geysers area would be a significant cumulative impact on plant communities and wildlife habitat in general.	Siting consideration for cumulative projects should take into account biological habitats.	- Applicant/ Developer	Reduced to insignificant
	Cumulative impacts would occur on sensitive species particularly serpentine chaparral, old-growth yellow pine woodland, and riparian communities.	Implementation of above listed mitigation measures would reduce significant adverse impacts to levels considered acceptable and therefore insignificant.		
	Development would result in a potentially significant cumulative loss of foraging habitat for raptors.			
Cumulative Impacts - Aquatic Resources				
	The cumulative effects of siltation, input of toxic chemicals either from operation or from accident, and from lowering of water levels in the streams and interruption of creek flow.	Strict adherence to the site-specific mitigation measures proposed to control siltation, accidents, and inputs of toxic chemicals will help to insure that cumulative impact in the Geysers area on aquatic resources are insignificant.	- Applicant/ Developer	Reduced to insignificant
CULTURAL RESOURCES AND PALEONTOLOGY				
Cultural Resources				
Phase 1 - Non-Drilling Exploration Activities				
Substantial and important cultural and paleontologic resources exist in The Geysers area as demonstrated by previous projects.	Some off-road and foot disturbance is probable.	No mitigation measures are suggested.		Insignificant
	Potential damage to cultural resources is possible during the placement of instruments used in anomalous surface heat flow studies and resistivity surveys.	No mitigation measures are suggested.		Insignificant
Phase 2 - Exploratory Drilling				
Substantial and important cultural and paleontologic resources exist the Geysers area as demonstrated by previous projects.	Road widening and cutting/filling activities will further disturb known sites which have already been impacted by existing roads and trails.	Sites of possible cultural interest will be avoided through redesign of facilities.	- Applicant/ Developer	Reduced to insignificant
	Drill pad and sump construction will disturb relatively large amounts of land making significant cultural resources impacts highly probable.	Construction activities shall be monitored by qualified individuals. Buried resources discovered will cause redirection of grading or construction activities until a determination of importance is made by monitor.	- Applicant/ Developer	To be determined at time of survey
		It is recommended that further survey occur on a site-specific basis.	- Applicant/ Developer	To be determined at time of survey

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Phase 3 - Full Field Development				
Substantial and important cultural and paleontologic resources exist the Geysers area as demonstrated by previous projects.	If development utilizes existing pads and access, anticipated impacts are similar but on a much smaller scale than for that of exploration.	Sites of possible cultural interest will be avoided through redesign of facilities.	- Applicant/ Developer	Reduced to insignificant
	As most prehistoric sites are small, feasibility in the placement of pipeline systems and power transmission towers should allow site avoidance.	Construction activities shall be monitored by qualified individuals. Buried resources discovered will cause redirection of grading or construction activities until a determination of importance is made by monitor.	- Applicant/ Developer	To be determined at time of survey
		It is recommended that further survey occur on a site-specific basis.	- Applicant/ Developer	To be determined at time of survey
Phase 4 - Operation and Maintenance				
Substantial and important cultural and paleontologic resources exist in The Geysers area as demonstrated by previous projects.	Significant adverse impacts to cultural resources could occur with any new construction during this phase.	Sites of possible cultural interest will be avoided through redesign of facilities.	- Applicant/ Developer	Reduced to insignificant
	Landform modification associated with geothermal development may cause an increase in slope instability and erosion resulting in potential impact to cultural resources.	Construction activities shall be monitored by qualified individuals. Buried resources discovered will cause redirection of grading or construction activities until a determination of importance is made by monitor.	- Applicant/ Developer	To be determined at time of survey
		It is recommended that further survey occur on a site-specific basis.	- Applicant/ Developer	To be determined at time of survey
Phase 5 - Abandonment				
Substantial and important cultural and paleontologic resources exist in The Geysers area as demonstrated by previous projects.		Abandonment activity should be restricted to the originally disturbed area to avoid potential impacts to cultural resources.	- Applicant/ Developer	Reduced to insignificant
Paleontologic Resources				
Substantial and important cultural and paleontologic resources exist in The Geysers area as demonstrated by previous projects.	Any ground disturbance could result in significant impact to fossil resources.	A qualified paleontologist shall be retained to monitor and assess sensitive fossil resources.	- Applicant/ Developer	Reduced to insignificant
Cumulative Impacts and Mitigation				
Substantial and important cultural and paleontologic resources exist in The Geysers area as demonstrated by previous projects.	Undoubtedly, areas to be developed under the cumulative scenario will contain cultural resources which may be inadvertently, adversely affected.	Field studies of potential project sites and monitoring exploration and grading shall minimize impacts.	- Applicant/ Developer	Reduced to insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
TRANSPORTATION				
Phase 1 - Non-Drilling Exploration Activities				
Traffic circulates through the study area on a network of state, county, and privately-owned roads. Most of these are built and maintained to carry relatively small amounts of traffic consistent with the area's rural character.	No significant impacts on transportation will occur since traffic generation during this phase of development is minimal.	Measures to assist in safety include use of warning vehicles, trips scheduled around peak hours, and the encouragement of car pooling.	- Applicant/ Developer	Insignificant
Phase 2 - Exploratory Drilling				
Traffic circulates through the study area on a network of state, county, and privately-owned roads. Most of these are built and maintained to carry relatively small amounts of traffic consistent with the area's rural character.	Heavy vehicle and employee traffic (50 to 60 trips per day) occurs during the 6 to 12 month exploratory drilling phase. Though the traffic generation is not necessarily significant, the heavy trucks and equipment will cause significant damage to County roadways not designated to handle such loads.	Road construction and improvement should occur prior to the start of exploratory drilling. Other measures to assist in safety include use of warning vehicles, trips scheduled around peak hours, and the encouragement of car pooling.	- Applicant/ Developer - Applicant/ Developer	Reduced to insignificant Reduced to insignificant
Phase 3 - Full Field Development				
Traffic circulates through the study area on a network of state, county, and privately-owned roads. Most of these are built and maintained to carry relatively small amounts of traffic consistent with the area's rural character.	The greatest increases in traffic will occur during the initial development phase although these additional levels will be temporary in nature. From 80 to 100 trips per day are generated over the 24 to 36 month typical well field development period for a power plant.	Road construction and improvement should occur prior to the start of exploratory drilling. Other measures to assist in safety include use of warning vehicles, trips scheduled around peak hours, and the encouragement of car pooling.	- Applicant/ Developer - Applicant/ Developer	Reduced to insignificant Reduced to insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Phase 4 - Operations and Maintenance				
Traffic circulates through the study area on a network of state, county, and privately-owned roads. Most of these are built and maintained to carry relatively small amounts of traffic consistent with the area's rural character.	Work trips can be expected to diminish from the peak construction phases. Typically there are 30 to 50 trips per day over the life of any one geothermal power plant and well field development project.	Road construction and improvement should occur prior to the start of exploratory drilling.	- Applicant/ Developer	Reduced to insignificant
		Employee car pools or a commuter bus system shall be established.	- Applicant/ Developer	
		A traffic safety plan shall be developed by the Applicant.	- Applicant/ Developer	
<u>Impacts of Roadways</u>				
Traffic circulates through the study area on a network of state, county, and privately-owned roads. Most of these are built and maintained to carry relatively small amounts of traffic consistent with the area's rural character.	Roadway deterioration will incrementally increase as a result of the transport of heavy trucks and equipment.	Road construction and improvement should occur prior to the start of exploratory drilling.	- Applicant/ Developer	Reduced to insignificant
	Significant traffic increases are not anticipated to occur along the principal state highways in the region, although slow-moving trucks may constitute a traffic hazard.	Other measures to assist in safety include use of warning vehicles, trips scheduled around peak hours, and the encouragement of car pooling.	- Applicant/ Developer	
	Specifically, geothermal activity in Project Areas 1 and 2 will create a potential nuisance and driving hazard on Cloverdale-Geyser Road.			
<u>Impact of Transport of Hazardous Wastes</u>				
Traffic circulates through the study area on a network of state, county, and privately-owned roads. Most of these are built and maintained to carry relatively small amounts of traffic consistent with the area's rural character.	As a percentage of total traffic volume, these are expected to remain about the same as existing levels through the end of the century. Since the total amount of traffic will increase, the percentage of the traffic transporting hazardous material is expected to decline.	Measures to assist in safety include use of warning vehicles, trips scheduled around peak hours, and the encouragement of car pooling.	- Applicant/ Developer	Reduced to insignificant
Phase 5 - Abandonment				
Traffic circulates through the study area on a network of state, county, and privately-owned roads. Most of these are built and maintained to carry relatively small amounts of traffic consistent with the area's rural character.	It is expected that trip generation would be about 30 trips per day over a 3 month abandonment procedure. Impacts would be less than exploratory drilling impacts.	Roads may be retained for other beneficial uses provided that effective erosion control measures have been implemented.	- Applicant/ Developer	Beneficial

Table S · IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Cumulative Impacts and Mitigations				
Traffic circulates through the study area on a network of state, county, and privately-owned roads. Most of these are built and maintained to carry relatively small amounts of traffic consistent with the area's rural character.	Cumulative development will generate additional heavy truck traffic in the study area, with the associated significant impact on roadway maintenance and highway safety. The occurrence of large, slow moving trucks on winding, mountain roads represents a significant safety hazard to other motorists.	Implementation of above listed mitigation measures would reduce significant adverse impacts to levels considered acceptable and therefore insignificant.	- Applicant/ Developer	Reduced to insignificant
AIR QUALITY				
Phase 1 - Non-Drilling Exploration Activities				
The air quality of an area depends on the temporal and special distribution of local emissions, the volume of air into which these emissions are emitted, the transport of pollutants and the nature of the chemical, and physical transformation from emitted species. The meteorology of the proposed lease sites is characterized by significant diversity.	Emissions associated with this phase include minor or incidental use of diesel powered equipment and vehicles and dust generation. The incidental and sporadic activities will not create significant air emissions.	Compliance with local county air pollution control rules and regulations, reductive equipment operation and dust control will ensure impacts remain insignificant.	- Applicant/ Developer - County Air Pollution Control	Reduced to insignificant
Phase 2 - Exploratory Drilling				
The air quality of an area depends on the temporal and special distribution of local emissions, the volume of air into which these emissions are emitted, the transport of pollutants and the nature of the chemical, and physical transformation from emitted species. The meteorology of the proposed lease sites is characterized by significant diversity.	Air pollutants will result from the diesel powered drilling equipment and from truck and passenger vehicles commuting to the drill site. Small numbers of vehicles dispersed throughout the area do not pose any threat to healthful levels of air quality.	Compliance with local county air pollution control rules and regulations, reductive equipment operation and dust control will ensure impacts remain insignificant.	- Applicant/ Developer - County Air Pollution Control	Reduced to insignificant
	Fugitive dust causes transitory and localized impacts. Regional particulate load levels will not be significantly affected. Local impacts may retard plant growth and dust plumes along the ridgeline may create objectionable visible impacts.	Fugitive dust generation should be minimized by enforcing reasonable driving speeds on dirt roads, by using water or oil spray to control dusty area, and by performing major grading activities in spring when natural soil moisture is high.	- Applicant/ Developer	Reduced to insignificant
	Well bleeds, another source of emissions, can create a significant air quality impact if a large number emit H2S which is then carried downwind to receptors.	The best available control technologies and/or state of the art technology shall be implemented to insure H2S emissions are below air pollution control standards.	- Applicant/ Developer	Potential of accidental release of a large amount of H2S though unlikely, could be significant adverse impact

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Reddual Impact
Phase 3 - Full Field Development				
Approximately 80 percent of the steam entering the power plant is ultimately lost to the atmosphere through evaporation in the cooling towers.	Impacts for full field development will be the same as those listed under Exploratory Drilling. Impacts will incrementally increase depending on the number of wells developed.	Mitigations include those listed under Exploratory Drilling above.	- Applicant/ Developer	Reduced to insignificant
Phase 4 - Operation and Maintenance				
The air quality of an area depends on the temporal and spacial distribution of local emissions, the volume of air into which these emissions are emitted, the transport of pollutants and the nature of the chemical, and physical transformation from emitted species. The meteorology of the proposed lease sites is characterized by significant diversity.	Redrilling and drilling of new make-up wells would be similar to the emissions discussed above. The major air quality concern is the release of combined stream flow from a number of wells at the power plant. Plant location and prevailing air flows have a dominant effect on dispersion patterns.	Mitigation measures include those listed under Exploratory Drilling above. Facilities shall be monitored and maintained throughout operation. Any new facility shall not contribute H2S concentrations such that the sum plus the background concentration exceeds the hourly standard.	- Applicant/ Developer - Applicant/ Developer	Reduced to insignificant Potential of accidental release of a large amount of H2S though unlikely, could be significant adverse impact
Phase 5 - Abandonment				
The meteorology of the proposed lease sites is characterized by significant diversity.	Combustion emissions and fugitive dust are the primary effects associated with abandonment but effects will be insignificant.	Fugitive dust generation should be minimized by enforcing reasonable driving speeds on dirt roads, by using water or oil spray to control dusty area, and by performing major grading activities in spring when natural soil moisture is high.	- Applicant/ Developer	Reduced to insignificant
Cumulative Impacts and Mitigations				
	Increased emissions from various vehicular and geothermal sources will occur. Of most concern in the increase in emission of hydrogen sulfide. On a cumulative basis, the impact from all existing facilities in addition to those which could conceivably be built is considered significant.	Implementation of above listed mitigation measures would reduce significant adverse impacts to levels considered acceptable and therefore insignificant except for the effect on population from the unlikely event of accidental release of a large amount of H2S emissions.	- Applicant/ Developer	Reduced to insignificant except for the unlikely event of the release of large amounts of H2S
ACOUSTICAL ENVIRONMENT				
Phase 1 - Non-Drilling Exploration Activities				
Ambient noise levels range from 30 to 45 dBA, but may rise by more than 10 dBA above these levels due to natural phenomena such as wind and rain. Sporadic manmade noises also occur within or adjacent to the leases.	Of surveys conducted during this phase, only a seismic survey may cause noise impacts but these impacts will not be significant.	Seismic surveys shall not be located closer than 366 meters (1,200 feet) from existing residences or other sensitive receptors.	- Applicant/ Developer - Noise Control Officer	Reduced to insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Phase 2 - Exploratory Drilling				
Ambient noise levels range from 30 to 45 dBA, but may rise by more than 10 dBA above these levels due to natural phenomena such as wind and rain. Sporadic manmade noises also occur within or adjacent to the leases.	Acoustical impacts occur during well pad installation, materials delivery, drilling and well installation, and access road installation. Of these, well and pad installation are likely to have the most impacts.	Noise standards shall be met between the hours of 7:00 A.M. and 10:00 P.M. Noise levels from drilling operations shall be muffled. Distance restrictions shall be in effect around sensitive receptors.	- Applicant/ Developer - Noise Control Officer	Reduced to insignificant
Phase 3 - Full Field Development				
Ambient noise levels range from 30 to 45 dBA, but may rise by more than 10 dBA above these levels due to natural phenomena such as wind and rain. Sporadic manmade noises also occur within or adjacent to the leases.	Noise sources during development include large diesel powered equipment for construction. These activities will occur mostly during the day.	Noise standards shall be met between the hours of 7:00 A.M. and 10:00 P.M. Noise levels from drilling operations shall be muffled. Distance restrictions shall be in effect around sensitive receptors. Wells and power plants shall be placed where produced noise will be atmospherically attenuated.	- Applicant/ Developer - Noise Control Officer	Reduced to insignificant
Phase 4 - Operations and Maintenance				
Ambient noise levels range from 30 to 45 dBA, but may rise by more than 10 dBA above these levels due to natural phenomena such as wind and rain. Sporadic manmade noises also occur within or adjacent to the leases.	Plant operations are expected to generate a noise level of approximately 76 to 77 dBA at 15 meters (50 feet). Additional noise will come from employees commuting to work.	Noise standards shall be met between the hours of 7:00 A.M. and 10:00 P.M. Noise levels from drilling operations shall be muffled. Distance restrictions shall be in effect around sensitive receptors. Wells and power plants shall be placed where produced noise will be atmospherically attenuated. Car pooling programs shall be encouraged.	- Applicant/ Developer - Noise Control Officer	Reduced to insignificant
Phase 5 - Abandonment				
Ambient noise levels range from 30 to 45 dBA, but may rise by more than 10 dBA above these levels due to natural phenomena such as wind and rain. Sporadic manmade noises also occur within or adjacent to the leases.	Impacts during this phase are not continuous, typically performed during the day and are considered insignificant.	No mitigation measures are required.		Insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Cumulative Impacts and Mitigations				
Ambient noise levels range from 30 to 45 dBA, but may rise by more than 10 dBA above these levels due to natural phenomena such as wind and rain. Sporadic manmade noises also occur within or adjacent to the leases.	The cumulative effect in the region would be an increase in ambient noise levels. The magnitude of the increase is dependent upon site-specific conditions; however, such noise levels would be substantially above that of similar, non-industrial areas in the region.	The monitoring and implementation of the above listed mitigations will reduce any significant adverse impacts to acceptable levels therefore insignificant.	- Applicant/ Developer - Noise Control Officer	Reduced to insignificant
SOCIOECONOMICS AND PUBLIC SERVICES				
Demographics and Housing				
All counties in the study have experienced substantial growth in the past 10 to 15 years. Some county plans contain expectations of continued growth from geothermal development; however, with a decline in steam reservoir temperatures, the level of geothermal development may have already peaked. The housing stock in Lake County, mainly single-family units, has risen in the last 10 years.	Activities are expected to be supported by the indigenous geothermal workers in the area. Development is not expected to create a significant adverse impact. Cumulative impacts include short-term demands for construction workers and housing and a small number of permanent geothermal workers. It is expected this level of growth could be accommodated without significant socioeconomic effect.	No significant impacts on population and housing were identified, therefore, no mitigation measures are provided.		Insignificant
Employment				
Lake County economy is based primarily on retail sales and services and government employment. Sonoma County is in transition form an economy heavily dependent on agriculture, construction, and resources to more urban center employment. The economy of Mendocino County is based primarily on agriculture, government, services, manufacturing, and tourism.	Employment generated by all phases of development is not anticipated to have significant impacts on the total labor supply in the county.	No significant impact on employment were identified, therefore, no mitigation measures are provided.		Insignificant
Fiscal Effects				
Geothermal development has had a substantial fiscal impact on Lake and Sonoma County and other local government entities. It is expected that geothermal revenues will continue to fluctuate due to oil price cycles and resource decline.	Cumulative projects will generate direct revenues to the counties within which such operations are developed. A generally positive effect on the fiscal resources of the involved county agencies is expected.	Fees shall be paid to appropriate State and county agencies.	- Applicant/ Developer	Beneficial

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Fire and Police Protection and Medical Services				
Fire A vulnerable wildland fire hazard area. The Geysers is served by both state and local fire fighting services with emergency service provided by the city's fire departments and in the unincorporated areas by contract agreement with the California Department of Forestry (CDF). **Police** Sonoma, Lake, and Mendocino County each maintain their own Sheriff's Department to provide protective services to the unincorporated portions of their respective counties. The CHP provides policing of traffic to unincorporated areas of Lake and Sonoma Counties. **Medical** Emergency medical services in The Geysers area are provided by private and county hospitals located in the larger urban areas.	A potential need for emergency services from fire and police protection and medical agencies may be generated by the increased human activity and operation of vehicles, but significant adverse impacts are not anticipated.	**Fire** Fire safety guidelines shall be provided by the CDF. Additional personnel will be provided as necessary. Emergency response and evacuation plans shall be developed. **Police** The use of private security forces shall be considered. A unified emergency notification plan shall be developed.	- Applicant/ Developer - CDF - Applicant/ Developer - CHP	Reduced to insignificant Reduced to insignificant
Water				
The principal source of water for urban and agricultural purposes in the region is groundwater. Surface water sources provide limited supplies of useable potable water.	Due to limited water resources, additional water demand from geothermal operations can result in adverse impacts to the current water resources. If adequate volumes of water are not present on-site, water demand will result in a significant adverse impact. There is also potential to over-use surface waters.	Assurance for the provision of adequate water and sewer service is required prior to development. Applicant shall obtain by right or purchase all water used. Permits shall be obtained for withdrawal and diversion of water from surface streams. Areas with insufficient water resources should consider importing water from local suppliers.	- Applicant/ Developer - Applicant/ Developer - Applicant/ Developer - Applicant/ Developer	Upon securing a reliable water source, impacts will be reduced to insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Wastewater				
Within the project area, central wastewater collection and treatment systems have been developed only in the larger communities. The balance of the area, including geothermal development, relies on individual septic systems to dispose of domestic and commercial sewage. Currently there are no known major impacts on area water quality due to reliance of on-site wastewater disposal practices. However, there is concern for the long-term maintenance of local water quality in the planning area.	Additional wastewater generated by the development and operation of geothermal facilities is considered an adverse, but not significant impact. Current wastewater disposal practices including collection and treatment systems and on-site systems will be sufficient to handle the additional wastewater.	Sanitary and hand washing facilities should be provided at each drill site. Assurance for the provision of adequate water and sewer service is required prior to development.	- Applicant/ Developer - Applicant/ Developer	Reduced to insignificant
Solid Waste				
No solid waste is being produced from the project areas currently, but substantial volumes of waste will be are generated during all phases of geothermal resource development.	Volumes of solid waste generated during drilling, field development, and operation will be an adverse impact. Landfills and hazardous waste management units will be incrementally impacted.	Applicant shall implement County Solid Waste Management Plans which include programs to reduce the quantities of non-hazardous solid waste being sent to landfills.	- Applicant/ Developer	Reduced to insignificant
Energy Utilities				
The planning area's energy needs are met by electricity provided by PG&E, and by bottled propane gas and fuel oil supplied by several local distributors. Natural gas is not available.	Construction operations will expend substantial amounts of energy and is considered a short-term adverse impact. Energy consumption itself represents a loss of nonrenewable resources but increased demand will be serviced by local companies and is not a significant impact to current service levels.	Facilities will be designed for optimum energy efficiency in accordance with the California Energy Commission standards.	- Applicant/ Developer - CEC	Reduced to insignificant
Schools				
Schools districts within Lake County near the project area include Kelseyville Unified School District, Konocti Unified School District and Middletown Unified School District. Each district serves kindergarten through high school.	The increase in students and the need for additional classroom space will result in a significant adverse impact to school services since the majority of schools are already operating over capacity.	Developers shall pay required state impact fees to mitigate school impacts resulting from geothermal-related development.	- Applicant/ Developer	Reduced to insignificant
Cumulative Impacts and Mitigations				
	The increase in demand for public services associated with geothermal development is likely to be insignificant. Each project must be assessed for its individual effect.	Implementation of above mitigation measures as well as additional mitigations prescribed on a site-specific basis shall reduce any significant impacts to an acceptable level and therefore insignificant.	- Applicant/ Developer	Reduced to insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
AESTHETICS				
Phase 1 - Non-Drilling Exploration Activities				
Visual elements within and adjacent to the project area are composed of natural elements of land, water, and vegetation with man-made forms including pipeline, pads, plants, and facilities interspersed within the natural setting.	No visual impacts will result from this phase.	No mitigation measures are required.		Insignificant
Phase 2 - Exploratory Drilling				
Visual elements within and adjacent to the project area are composed of natural elements of land, water, and vegetation with man-made forms including pipeline, pads, plants, and facilities interspersed within the natural setting.	Visual modifications include changes in form line and texture of the area, introduction of a visually obtrusive element (drill rig), changes of the landscape to that of partially developed, and possible changes in viewer expectations. These changes have the potential to result in a significant visual impact depending on viewer sensitivity, proximity, and relative scale from the drilling activity. (Impacts are not expected in Project Area 2 but may be experienced elsewhere for views of Areas 1 and 3.)	Pad, roads, pipelines, plants, and transmission facilities should be designed so as to present the least visual intrusion on views from popular use areas. The use of local rock types for road and pad surfacing material will help minimize color contrast between engineered and natural land forms.	- Applicant/ Developer	Reduced to insignificant
Phase 3 - Full Field Development				
Visual elements within and adjacent to the project area are composed of natural elements of land, water, and vegetation with man-made forms including pipeline, pads, plants, and facilities interspersed within the natural setting.	More activity will be visible during construction than at any other time. Impacts are the same as listed above, plus changes in lighting and potential for glaring and additional visually obtrusive elements such as road cut and power plants. These changes have the potential to result in a significant visual impact depending on viewer sensitivity, proximity, and relative scale from the drilling activity. (Impacts are not expected in Project Area 2 but may be experienced elsewhere for views of Areas 1 and 3.)	Pad, roads, pipelines, plants, and transmission facilities should be designed so as to present the least visual intrusion on views from popular use areas. The use of local rock types for road and pad surfacing material will help minimize color contrast between engineered and natural land forms. On visual edges such as ridgelines, construction of facilities should maintain a low profile design. Plants, buildings, and other structures should be constructed and colored in natural colors. Cut and fill areas shall be revegetated.	- Applicant/ Developer	Reduced to insignificant

Table S-1 - IMPACT AND MITIGATION SUMMARY - GEYSERS EIR

Existing Conditions	Issues and Impacts	Mitigations	Responsible for Mitigation	Residual Impact
Phase 4 - Operations and Maintenance				
Visual elements within and adjacent to the project area are composed of natural elements of land, water, and vegetation with man-made forms including pipeline, pads, plants, and facilities interspersed within the natural setting.	Cooling towers emit saline drift droplets and warm vapor that condense into large visible plumes which may cause an aesthetic impact. Night lighting for structures, well pads, access road entrances, and other areas may create pinpoints of light as well as the potential for illumination from steam and foggy conditions. (Visual elements of this phase are similar to lease development exempting the construction activity. Significant visual impacts depend on viewer sensitivity, proximity, and relative scale from the drilling activity. Impacts are not expected in Project Area 2 but may be experienced elsewhere for views of Areas 1 and 3.)	On visual edges such as ridgelines, construction of facilities should maintain a low profile design. Pad, roads, pipelines, plants, and transmission facilities should be designed so as to present the least visual intrusion on views from popular use areas. The use of local rock types for road and pad surfacing material will help minimize color contrast between engineered and natural land forms. Plants, buildings, and other structures should be constructed and colored in natural colors. Cut and fill areas shall be revegetated.	- Applicant/ Developer	Reduced to insignificant
Phase 5 - Abandonment				
Visual elements within and adjacent to the project area are composed of natural elements of land, water, and vegetation with man-made forms including pipeline, pads, plants and facilities interspersed within the natural setting.	Once materials are removed, visual scars will consist of the areas used for drilling pads, plant, and ancillary facility pads and roadways. Site restoration with revegetation and recontouring will substantially reduce impacts. (The level of impact reduction depends on distance of viewer to site and the relative scale of the site within the entire viewshed.)	Revegetation plans addressing abandonment should be approved in advance of final project approvals. Cut and fill areas will be revegetated to reduce visual contrast with the surrounding area.	- Applicant/ Developer - Applicant/ Developer	Reduced to insignificant
Cumulative Impacts and Mitigations				
	If development is concentrated in areas that can be seen by large portions of the general public, a significant impact will result. Particularly pertinent viewsheds would be from Highway 175 and the communities in the area. It is unlikely the overall character will change significantly due to other constraints in land development.	Cumulative mitigation measures include the monitoring and implementation of all measures previously listed. No effective mitigation is available to completely mitigate all impact, but significant adverse impacts will be reduced to a level considered acceptable and therefore insignificant.		Reduced to insignificant

EXHIBIT E

STATEMENT OF OVERRIDING CONSIDERATIONS

The California State Lands Commission adopts this Statement of Overriding Considerations with respect to the impacts identified in the Final EIR which cannot be reduced, with mitigation, to a level of insignificance or which are nonmitigable, specifically those associated with:

- accidental release of hazardous materials during Exploratory Drilling, Field Development, and Operation and Maintenance,
- accidental release or improper disposal of hazardous wastes during Exploratory Drilling, Field Development, and Operation and Maintenance,
- use of surface water sources to support resource conservation through reservoir injections,
- impacts related to the geothermal resource extraction such as induced seismicity and ground subsidence,
- the complex nature of zonal encroachment making feasible mitigation unknown, the uncertainties of the availability of sufficient fluids which is a major factor affecting conservation of the steam resource at The Geysers, and,
- hazardous H_2S emissions from a well blowout or other uncontrolled situation are not mitigable.

The Commission hereby finds that the Geothermal Leasing Program (Program) will have numerous benefits to the State of California (State) and to and within the project areas where geothermal projects may be undertaken.

The Program will generate non-tax revenues to the State of California. The proposed negotiated lease provides that a ten percent (10%) royalty will be paid to the State. Such percentage is to be applied to the gross revenue, as defined in the lease, that will be generated if lease development occurs. This revenue will accrue to the State Teachers' Retirement System (STRS).

Subsequent geothermal development within the project areas would have direct positive impact on the local tax base of local counties from the increase in assessed valuation due to construction of improvements necessary to geothermal production. The overall effect of these tax revenues, though not representing a substantial additional source of revenue, will slow the decline of geothermal revenues currently experienced in Lake and Sonoma Counties.

Geothermal development results in substantial generation of sales taxes associated with the goods and services consumed in the local area. An additional positive and substantial source of revenue associated with geothermal development is the sales, income, and property taxes paid by the permanent geothermal work force and the payroll spending which supports the local economy.

The direct costs attributed to geothermal development are the county and local agency expenditures for processing permits, administration, and environmental review of the specific projects. However, these costs are generally offset by filing and permit fees. Property tax revenues from geothermal facilities more than make up the difference in the cost of administration and general county services required by geothermal development. Local government processing costs are small in comparison to revenues generated to such governments.

In addition, the counties have used special agreements with geothermal developers to provide specific finding to mitigate project impacts. It is expected that such agreements will continue to be used as a means of compensating any public costs associated with geothermal development.

Other positive effects result from geothermal development. Geothermal energy provides an alternative to the use of fossil fuels to generate electricity and to provide heating of space and water. Continued development of technology to use both high and low temperature geothermal resources will contribute a partial alternative to combustion of hydrocarbon fuels for power production. Development of alternative energy sources has become increasingly important in the State to lessen reliance on hydrocarbon-based resources and the extraction of geothermal resources on State lands is an integral part of energy projections for California.

The proposed leasing action will have positive impact on efforts to manage The Geysers resource. Present data suggests that the resource is not renewable, and that commercial productivity over the long-term is dependent on a coordinated management approach, that is, incorporation of water injection and operational resource conservation procedures. The State Lands Commission participates on the TAC of the Interim Coordinated Resources Management Plan effort and supports its collective direction regarding management of The Geysers resource. The mitigation measures which are proposed in the EIR provide a standard for other permitting agencies which approve geothermal development projects. Thus, the State Lands Commission leasing action, through its support of resource management plans, policies and model mitigation measures, will contribute to the long-term productivity of The Geysers and will also minimize short-term impacts created from geothermal development.

The Commission further finds that all mitigation measures identified in the EIR have been imposed to avoid or lessen impacts, to the maximum extent possible, and furthermore finds that the No Project Alternative, Leasing of Portions of the Project Areas, Prohibiting Construction of Power Plants, Alternative Land Use, and Alternative Technologies are infeasible because they: 1) only partially offset significant environmental impacts; 2) do not provide the benefits described; 3) do not fully fulfill the objectives of the proposed project; or 4) are socially, economically, or technically infeasible.

Based on the above discussion, the Commission finds that the benefits of the proposed Program outweigh the unavoidable adverse environmental effects and considers such effects acceptable.