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COMMISSION DECISION
on the
Sacramento Municipal
Utility District's

APPLICATION
for
CERTIFICATION

for the
SMUDGEO NO. 1
Geothermal Project

80-AFC-1

MARCH 1981

CALIFORNIA ENERGY COMMISSION

P800-81-001

STATE OF CALIFORNIA
ENERGY RESOURCES CONSERVATION
AND DEVELOPMENT COMMISSION

In the Matter of:	
Application for Certification of the Sacramento Municipal Utility District's SMUDGEO UNIT #1	Docket No. 80-AFC-1
	COMMISSION DECISION

This Decision adopts the Committee's "Proposed Decision", including the Findings, Conclusions and Appendices contained herein.

The Executive Director is to: 1) transmit a copy of this Decision and appropriate accompanying documents to all persons and agencies specified under Public Resources Code (PRC) section 25537 and Title 20, California Administrative Code (CAC) section 1768; and 2) ensure that the provisions of PRC section 25703 are complied with within four months of the date on which this Decision is final. The final date for this Decision is the date on which it is signed by voting members of the Commission and filed with the Secretariat (Docket Unit).

The Application for Certification in this matter is APPROVED, subject to the terms identified by the Committee in its Commission Decision.

Dated: March 25, 1981

RUSSELL L. SCHWEICKART,
Chairman

C. SUZANNE REED,
Commissioner

EMILIO E. VARANINI, III,
Commissioner

JAMES A. WALKER,
Commissioner

ARTURO GANDARA,
Commissioner

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On February 5, 1981, the Evidentiary Hearing was conducted in Sacramento to receive direct testimony supporting Applicant-Staff proposed findings, conclusions, and conditions in the following topic areas:

- Transmission Line
- Air Quality
- Public Health and Noise
- Geotechnical, Seismicity and Structural Engineering
- Waste Management
- Safety
- Civil Engineering
- Socioeconomics
- Cultural Resources
- Environment
- Need and Financing

Additionally, findings and conditions were proposed by two intervenors: Mr. Robert Reynolds, Lake County Air Pollution Control Officer, in the area of air quality; and Mr. James Botz, Sonoma County Counsel, in the area of socioeconomics.

Since the SMUDGEO #1 Project will be constructed on federal lands, state and federal agencies participated in a Joint Environmental Statement (JES). This impact and mitigation survey was released in final form on February 18, 1981, and will be submitted to the Commission at its March 25, 1981, Business Meeting for approval before consideration of this Proposed Decision.

Public Resources Code Section 25532 requires that the Commission establish a monitoring and compliance system to ensure that any certified facility is constructed and operated to avoid significant environmental damage. As in NCPA #2* the United States Geological Survey with the Bureau of Land Management and Commission staff has prepared a Compliance Monitoring Report that will be released on March 11, 1981. Following public comment on March 18, 1981, the Committee will submit a recommendation to the Commission to adopt, amend or reject the Report.

* See the Northern California Power Agency's Geothermal Project No. 2 79-AFC-2, Publication No. 800-80-006.

In the specific subject area discussions (Part Two, Sections 1 through 11) the Committee highlights the evidentiary presentations, including the AFC, FJES, data inquiries and responses, workshop notes, staff anlayses, and direct testimony. In most cases, the findings, conclusions and conditions jointly proposed by Applicant and Staff have been approved by the Committee. The jointly-proposed findings, conclusions and conditions are contained in Appendix A and contain, without identification, undisputed amendments submitted at the February 5, 1981, Evidentiary Hearing. Disputed amendments and their resolution are fully discussed in the relevant subject areas of Part Two. Thus, the Committee's recommendation of terms to be imposed on Applicant's application is found in the "Committee Findings and Conclusions" throughout Part Two, Appendix A, and Appendix B (Northern Sonoma County Air Pollution Control District's Determination of Compliance).

The provisions of Public Resources Code Section 25403.5 governing the implementation of electrical load management standards have been considered by the Committee. A determination of conformity with that statute is recommended.

PART TWO

1. TRANSMISSION LINES

a. TRANSMISSION LINE ENGINEERING

Steven K.W. Breece, Electrical Engineering Assistant at Sacramento Municipal Utility District (SMUD), participated in the preparation of AFC Section 8.0 "Electric Transmission Facilities" and testified in support of the jointly-sponsored conclusions and conditions for this area (Appendix A, "Transmission Line Engineering" section). Transmission facilities will consist of a 3,180 foot tap line, suspended on three double circuit steel lattice towers, which connect to a Pacific Gas and Electric (PG&E) 230 kV transmission line west of the site. The tap line towers will be located along existing roads and cleared areas. Electricity generated by the plant will be added to the existing power interchange agreement with PG&E. Integration with the existing Geysers Area network is illustrated in Figure 8.1-1 on the following page.* This route (designated as Alternative C) was selected after workshops and discussions between the Applicant and Staff.

The proposed route requires a 300 foot access road to its final structure (designated C-4 in Figure 8.1-2 on the second following page). It passes through unforested habitats and is not expected to have any significant environmental impacts (Section 10 of this Decision fully discusses the environmental setting of the proposed plant and related facilities). Because of cultural resources investigation techniques, the Applicant will consult an archaeologist if land preparation for the tap line unearths artifacts.

The Final Joint Environmental Statement evaluated the routes proposed by Applicant and supports Alternative C as preferable in environmental terms (for example, it will require only 300 feet of new access road compared to 600 feet for either of the other routes).

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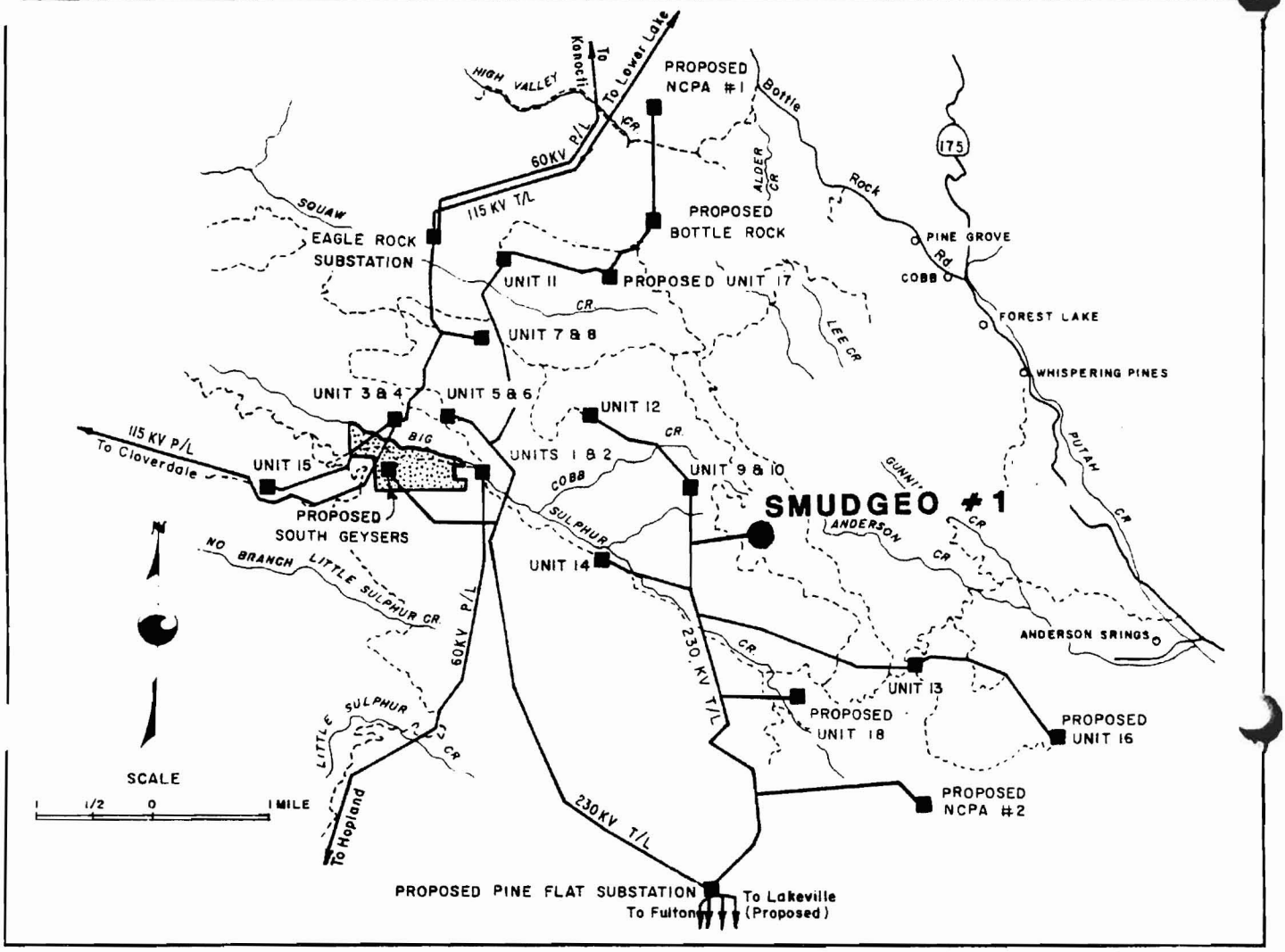
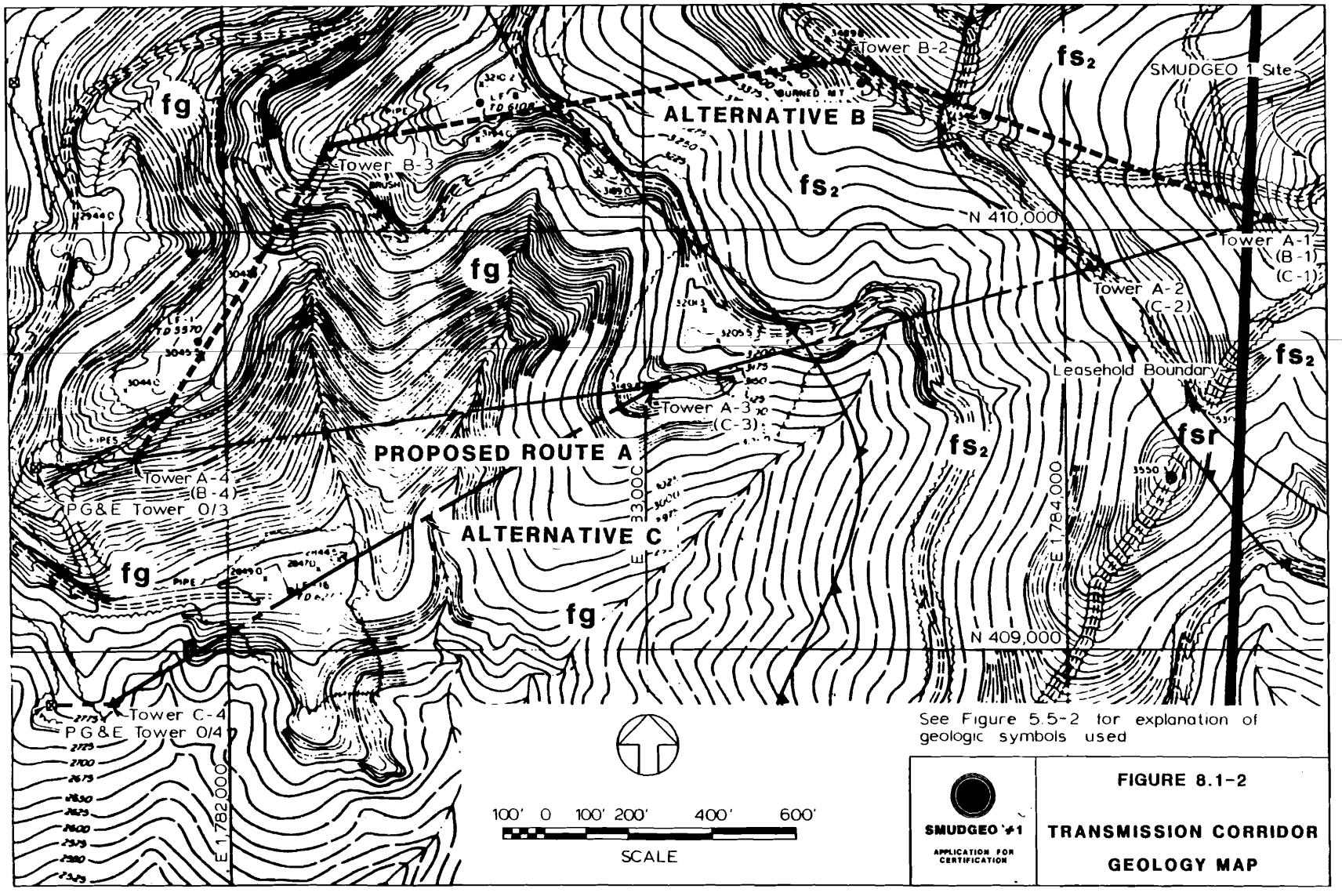
* Throughout this Decision graphics are inserted to clarify text. Attributions are contained in the illustrations and, to maintain the reference source, the original numbering of such work has not been revised.



Source: South Geysers NOI, Figure VI-1

SMUDGEO #1 APPLICATION FOR CERTIFICATION	FIGURE 8.1-1 GEYSERS AREA TRANSMISSION SYSTEM


Tower B-2
Tower B-3
Tower A-1
(B-1)
(C-1)
Tower A-2
(C-2)
Tower A-3
(C-3)
Tower A-4
(B-4)
PG&E Tower 0/3
Tower C-4
PG&E Tower 0/4
SMUDGEO 1 Site
ALTERNATIVE B
PROPOSED ROUTE A
ALTERNATIVE C
Leasehold Boundary
fg
fs2
fsr
N 410,000
N 409,000
E 1,784,000
E 1,782,000
3300
100' 0 100' 200' 400' 600'
SCALE
See Figure 5.5-2 for explanation of geologic symbols used
SMUDGEO #1
APPLICATION FOR CERTIFICATION
FIGURE 8.1-2
TRANSMISSION CORRIDOR
GEOLOGY MAP

Joel B. Klein, Electric Transmission System Program Specialist at the Commission, participated in Staff's evaluation of the Applicant's information and testified in support of the jointly-sponsored conclusions and conditions. He explained at the hearing that the emphasis of his filed testimony clearly supports the preferability of Alternative C.

COMMITTEE FINDING AND CONCLUSION

Given the undisputed evidence, the Committee finds that the Alternative C route complies with applicable standards. The Committee concludes that if the conclusions and conditions in Appendix A are implemented the tap line will not create significant adverse environmental impacts.

b. TRANSMISSION LINE SAFETY/NUISANCE

Mr. Breece also testified on behalf of the Applicant to support the jointly-sponsored findings, conclusions and conditions in Appendix A. The tap line will be 230 kV to integrate with the PG&E line. Its capacity will be about 330 MW. Conductor size was chosen for strength characteristics and to minimize corona; the use of double circuit towers increases the flexibility of the system. Topography restricts views in the area of the transmission line to existing service roads; skylining will be limited to views from the immediate vicinity of the towers.

Al McCuen, a Health and Safety Program Specialist at the Commission, participated in Staff's analysis of Applicant's information on safety and nuisance and testified in support of the jointly-sponsored findings, conclusions and conditions. He pointed out that the lack of residences near the transmission line route make it unlikely that any significant noise impact would occur

(see Section 3, "Public Health and Noise" for a more complete discussion). Corona noise may increase to 40 db(a) at 100 feet with rain-soaked conductors but such level is acceptable under the Sonoma County General Plan Noise Element; noise during dry conditions is expected to be barely detectable from ambient sound. Also due to the remoteness of the plant site and related facilities, it is expected that no significant radio or television interference will occur. (Staff Analysis, page 11, attached to "Transmission Line Engineering and Safety/Nuisance" section in Appendix A of this Decision).

COMMITTEE FINDINGS AND CONCLUSIONS

Based on the evidence and analysis presented by Applicant and Staff the Committee finds that the proposed transmission line can be constructed and operated without creating safety risks or nuisances. Provided that the conditions specified in Appendix A are fulfilled, this project can be constructed and operated in compliance with applicable standards, laws and regulations.

DETERMINATION OF COMPLIANCE

PRC Section 25523(d) requires the Commission to make findings regarding the conformity of a proposed site and related facilities to air quality standards. If the Commission finds that there is noncompliance with any state, local or regional ordinance or regulation, it must consult with the involved agency and attempt to correct or eliminate the noncompliance. If noncompliance cannot be corrected or eliminated, the Commission shall inform the agency if it makes a determination under section 25525 that the "facility is required for public convenience and necessity and that there are not more prudent and feasible means of achieving such public convenience and necessity."

To meet air quality requirements the Commission developed Section 1744.5, Title 20 California Administrative Code:

Air Quality Requirements: Determination of Compliance

(a) The applicant shall submit in its application all of the information required for an authority to construct under the applicable district rules, subject to the provisions of Appendix B, part (k) of these regulations.

(b) The local air pollution control officer shall conduct, for the commission's certification process, a determination of compliance review of the application in order to determine whether the proposed facility meets the requirements of the applicable new source review rule and all other applicable district regulations. If the proposed facility complies, the determinations shall specify the conditions, including BACT and other mitigation measures that are necessary for compliance. If the proposed facility does not comply, the determination shall identify the specific regulations which would be violated and the basis for such determination. The determination shall further identify those regulations with which the proposed facility would comply, including required BACT and mitigation measures. The determination shall be submitted to the commission within---180 days (for any application filed pursuant to section 25540.2---of the Public Resources Code) from the date of the filing.

(c) The local district and the Air Resources Board shall provide a witness at the hearings held pursuant to section 1748 to present and explain the determination of compliance.

(d) Any amendment to the applicant's proposal related to compliance with air quality laws shall be transmitted to the APCD and ARB for consideration in the determination of compliance.

At the Prehearing Conference on January 12, 1981, Michael W. Tolmasoff, Air Pollution Control Officer of the Northern Sonoma County Air Pollution Control District (NSCAPCD), presented a conditional determination of compliance (DOC) and received comments from Applicant and Staff. Based on those comments he amended the DOC and resubmitted it to the Committee (see Appendix B of this Decision) on January 28, 1981. At the February 5, 1981, Evidentiary Hearing, Mr. Tolmasoff participated in the air quality presentation discussed throughout this section.

Hydrogen Sulfide (H_2S): The DOC found that due to uncertainties in numerical modelling the H_2S emission rate of 50 gm/gross MWhr proposed by Applicant "might possibly prevent the attainment or interfere with the maintenance of the state ambient air quality standard" and therefore required BACT at a 5 lb/hr emission rate (Findings 1-3). A secondary H_2S control system may be needed to achieve the 5 lb/hr emission rate. However, because the APCD recognizes potential improvements in ambient background on or about the time SMUDGEO #1 would go commercial, the DOC contains procedures by which the Applicant can seek to operate the plant at an emission rate of 50 gm/gMW-hr if approved by the NSCAPCD, Commission and ARB (Finding 13A).

Sulfur Compounds (calculated as Sulfur Dioxide (SO_2)): Applicant's proposed emission of less than 1,000 ppm SO_2 will comply with the NSCAPCD's Rule 455(a) limit.

Particulate Matter: Under worst case conditions, and assuming proper design of the Stretford balance tank cooling tower, Applicant will comply with the 0.20 grains per actual cubic foot limit specified in NSCAPCD Rule 420(d)(a).

The DOC requires that Applicant immediately notify the steam supplier

of unscheduled outages (Finding 11). Conditions for compliance with applicable air quality standards are listed in Appendix B which the APCD states are sufficient to ensure conformity.

a. AIR QUALITY

Herbert D. Entrekin, Supervisor of Meteorology at Stone & Webster Engineering Corporation, participated in the preparation of AFC Section 5.3 on air quality and subsequent data responses. At the hearing he testified in support of the jointly-sponsored findings, conclusions and conditions (see Appendix A).

The AFC Appendix A study* consists of four elements:

- Analysis of historical emissions and aerometric data to identify recurring worst case meteorological regimes;
- Acquisition and interpretation of current air quality data to define present ambient hydrogen sulfide concentration levels throughout the Geysers KGRA;
- Performance of tracer tests to provide specific source-receptor relationships to estimate expected impacts from the facility under specific meteorological regimes; and
- Numerical air quality simulation modelling to examine power plant impacts under meteorological conditions possibly more severe than those encountered during tracer tests and examine possible impacts at receptor locations not covered by the tracer monitoring network.

On September 5, 1979, Applicant contracted with Science Applications, Incorporated (SAI) to develop a detailed air quality and meteorological monitoring network, and the Environmental Systems and Service to perform tracer tests. Early onset of winter conditions, however, affected tracer tests conducted on November 10 and 29, 1979, and January 23, 1980. Applicant therefore supplemented those results with terrain dispersion modelling

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* Amended in a Final Report: "Assessment of the Sacramento Municipal Utility District's Proposed Geothermal Power Plant--Volume III. Final Worst-Case Air Quality Analysis", October 3, 1980, SAI No. 217-EF80-180. Docket No. 80-AFC-1, October 15, 1980.

(also conducted by SAI). Preparation of the study included invitations to CEC, the ARB and the Sonoma County Air Pollution Control District to meet (the Lake County APCD was unable to attend). The supplementary program developed was integrated with the remaining two tracer tests with dispersion modelling.*

In June 1980 Applicant submitted revisions to AFC Section 5.3 Air Quality. H_2S emission rates were reduced to 50 gm/gross MWhr, or 8.0 lbs/hr. The H_2S removal equipment will consist of the surface condenser, Stretford process treatment of noncondensibles and condensate treatment. The steam entering the turbine is expected to have an H_2S concentration of 60 ppm ($\pm$ 20). The approximate steam rate is about 1,000,000 lbs/hr so entering steam will contain about 60 $\pm$ 20 lbs H_2S/hr. The overall H_2S removal efficiency required is 90 percent based on 80 ppm H_2S in the steam.

Noncondensible steam to the Stretford unit is estimated to be less than 6,000 lbs/hr. Based on 99.9 percent removal of H_2S in the Stretford unit, the maximum amount of H_2S released from this source to the environment (assuming 100 percent partitioning) would be about 0.08 lbs/hr (80 lbs/hr x 0.001).

H_2S removal efficiency required of a condensate treatment system has been determined for various amounts of H_2S contained in the condensate (see AFC Table 1.3-2 and chart at AFC page 5-5, revised June 1980).

Applicant's witnesses** stated that the worst case analysis is based on an H_2S emission rate of 8 lbs/hr. Although the proposed plant is not expected

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* John J. Mattimore letter to John Geesman, February 19, 1980. Docket No. 80-AFC-1, February 19, 1980.

** RT 357

to contribute more than one or two parts per billion (ppb) to ambient H_2S concentration, the ambient background concentration is projected at 24 parts per billion, causing the NSCAPCD and the ARB to consider the SMUDGEO #1 impact as a possible contributor to a violation of air quality standards.

To conform with air quality standards, the Applicant agreed that H_2S emissions from the power plant shall be no greater than five pounds/hour, but could be 50 grams per gross megawatt hour if SMUD can satisfy the APCO--based on normal operations, namely power plants as well as stacking operations--that impacts in the Anderson Springs area do not exceed or equal 22 parts per billion. (RT 358)

Without challenging the proposed findings, conclusions and conditions, Mike Tolmasoff, Northern Sonoma County Air Pollution Control Officer, cross-examined Applicant's witness. Discussion confirmed all parties' agreement to the January 12, 1981, plan to establish up to three monitoring stations. (RT 372). Additionally, Mr. Reynolds clarified that during the initial operation of SMUDGEO #1:

> "...if the 25 parts per billion level is exceeded for any reason--it does not necessarily have to be stacking of or a power plant operation, but then the five pounds per hour H_2S emissions limitation would apply." (RT 373)

Richard Buell, Associate Mechanical Engineer at the Commission, testified in support of the jointly-sponsored findings, conclusions and conditions. He concurred with Applicant's witness that compliance with air quality standards could be met by the proposed project if the H_2S emission rate of five pounds/hour is maintained. He also supported the acceptability of increasing the emission rate to eight lbs/hour if Finding 13 in NSCAPCD's Determination of Compliance is met. (RT 375-376)

Dr. Thomas W. Tesche, an employee of SAI, testified that he has been involved with a number of field measurement programs and complex terrain dispersion modelling studies during the past seven years. He explained that the original air quality analysis, based solely on the use of historical data and tracer tests was augmented after the Lake County APCO expressed concern. Workshops* were conducted to review modelling assumptions, model selection, model evaluation procedures and the method for applying the model for future 1984 impacts. The results of the modelling work established a historical worst case day impact by the project of two parts per billion H_2S. (RT 391-392)

Bob Reynolds, Lake County APCO, conducted specific cross-examination on the two ppb maximum H_2S impact. Mr. Tesche clarified that SAI had tried to "define that particular combination of meteorological regimes that would lead to the worst case overall impact in the Geysers arising due to not only the SMUD project, but due to all other sources in populated receptor areas." (RT 403) Mr. Reynolds also filed testimony and proposed findings (RT 384-389) and emphasized his concern for Applicant and Staff's jointly-proposed Finding number 18:

> "A reasonable estimate of worst-case impacts from SMUDGEO #1 power plant emissions is a contribution no greater than 2.0 ppb H_2S at the sensitive receptor (at 8 lbs/hr emission rate)."

He explained that "the model will step forward in the future, will be utilized elsewhere and it's important that we document very carefully all aspects of the model, how it can be utilized and how it shouldn't be utilized before we make findings of fact based primarily on it." Therefore, he proposed an alternative Finding number 18:

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* A list of contacts is contained at RT 398-400.

> "The expected worst-case impact from the SMUDGEO #1 power plant, utilizing an air dispersion model, is a contribution no greater than 2.0 ppb H_2S. The NSCAPCD and LCAPCD believe there is reasonable probability these model results may be an underestimate." (underline in original).

To clarify the reservations expressed by the Lake County Air Pollution Control District, the Committee proposed a supplementary paragraph to the jointly-sponsored Finding 18:

> "These estimates, made utilizing an air dispersion model, do contain uncertainties such that in the view of Lake County Air Pollution Control District and Northern Sonoma County Air Pollution Control District, the model results may be an underestimate."

This addition was accepted without objection by all the parties (RT 419-420), but the Applicant re-emphasized that the uncertainty expressed was by the counties and not the joint sponsors (Applicant and Staff).

b. ABATEMENT SYSTEMS AND TURBINE BYPASS

Applicant presented two witnesses to support the jointly-sponsored findings, conclusions and conditions (Appendix A, Air Quality): George Domahidy on abatement systems and P.V. Kleinhans on turbine bypass.

Mr. Domahidy testified that the Stretford process steam bypass and secondary H_2S abatement with hydrogen peroxide will restrict emissions to comply with state and county law. (RT 422-434)

Richard Kishi, Mechanical Engineer at the Commission, testified in support of the jointly-sponsored findings, conclusions and conditions. He agreed with other witnesses that restraining H_2S emissions to five lbs/hr will meet air quality standards.

Mr. Kleinhans testified that the purpose of the turbine bypass system is to allow full H_2S abatement processing of bypass steam. It prevents lifting

of the main safety valves following a turbine generator step load reduction up to and including a full load rejection. Steam flow can be routed to the condenser on unit startup and shutdown. Under cross-examination by the LCAPCO and NSCAPCO he provided specific information on the reliability of the abatement system. (RT 448-459)

COMMITTEE FINDINGS AND CONCLUSIONS

The Committee accepts Northern Sonoma County Air Pollution Control District's Determination of Compliance, supplemented by the jointly-sponsored findings, conclusions and conditions from Applicant and Staff to determine that the plant can be constructed and operated in compliance with air quality standards. Finding 13A in the Determination of Compliance is noteworthy because it establishes the willingness of the Air Pollution Control District to remain flexible towards increased H_2S emissions in the future if actual conditions necessitate, while imposing limitations on operation currently thought necessary to preserve air quality.

3. PUBLIC HEALTH AND NOISE

a. PUBLIC HEALTH

Herbert D. Entrekin, Supervisor of Meteorology at Stone & Webster, participated in the preparation of Section 6.0 "Public Health" in the Applicant's AFC and testified in support of the jointly-sponsored findings and conclusions in this area. At the hearing Applicant submitted a revision to proposed Conclusion 2c on mass balance measurements which was accepted without objection.* Additionally, he introduced a contract report from Systems Applications, Inc. on public health analyzing the effects of hydrogen sulfide, sulfur dioxide, particulates, ammonia, sulfates, boron, arsenic and mercury (the report is included in the AFC as Appendix F).

Hydrogen sulfide (H_2S) is a component of geothermal steam identified as a public health hazard. Available literature records accidental occupational exposures causing acute systemic and subacute irritative poisoning at high concentrations. Irritation to mucous membranes occurs at lower levels of exposure. Both situations are controlled by a 10 ppm H_2S exposure standard (8 hours) set by the California Occupational Safety and Health Administration (OSHA). Scant evidence is available on the health effects of chronic exposure to low concentrations of H_2S but such condition has been associated with headaches and general malaise. Because of the nuisance impact (rotten egg odor), the California Air Resources Board (ARB) has set an ambient air quality standard of 0.03 ppm average over 1 hour. Recent data from monitoring units in The Geysers Area (February 1976 through September 1977) record less than 1 percent exceedance of the hourly average ambient standard.

Sulfur Dioxide (SO_2) is a "regulated pollutant"** under the Federal Clean

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* Revisions to previously filed proposed findings, conclusions or conditions that were accepted by all parties are noted throughout the text of this Decision. Appendix A incorporates such changes without comment.

** A pollutant identified as a potential danger to public health.

Air Act of 1970, reflecting epidemiological studies identifying it as a cause of adverse health effects. The ARB's 24-hour standard of 0.05 ppm SO_2 emissions* is the strictest applicable limit but Geysers Area monitorings record no level greater than 0.01 ppm.

The ARB has set a standard of 25 ug/m^3 (averaged over 24 hours) for sulfates. In geothermal plants sulfates are produced from the oxidation of SO_2. Because the emission rate of SO_2 in The Geysers Area has been less than 0.009 ppm it is not likely that sulfates will ever exceed the California standard (see Appendix F, part IV, AFC).

Like SO_2, TSP matter was designated as a regulated pollutant under the Clean Air Act of 1970. Although the acceptable level of TSP is subject to debate, monitored levels in The Geysers Area are below the ARB's annual average of 60 ug/m^3 and 24-hour average of 100 ug/m^3.

Ammonia (NH_3) will be a major component of the atmospheric emissions from the Applicant's plant. However, NH_3 concentrations measured inside existing units are well below those demonstrated to produce adverse health effects. The ammonia in the plant is diluted upon emission and rapidly neutralized by other atmospheric conditions.

Mercury (Hg) in high doses causes systemic poisoning; chronic exposure to low levels causes neurological poisoning that may be only partially reversible. Hg is predominantly present in geothermal steam at The Geysers as elemental mercury vapor but monitoring in the area atmosphere and areas affected by prevailing winds indicate that it presents no risk to public health.

Inhalation of arsenic (As) and its inorganic compounds chiefly cause irritative effects. The carcinogenic potential of As is currently being debated. Neither the federal nor state government has established ambient

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* In the presence of oxidant or total suspended particulates (TSP).

standards. Although the American Conference of Governmental and Industrial Hygienists has proposed a threshold limit value of 0.05 mg/m^3 for As trioxide (III), no impact on public health is expected because no gaseous forms of As have been detected after steam is condensed at The Geysers, and because As (III) quickly oxidizes in the atmosphere to arsenic pentoxide.

Boron (B) is not generally considered a serious toxicant. No monitoring of B in the atmospheric effluent in The Geysers has been conducted but calculations on cooling tower exhaust indicate emissions of about 0.37 ug/m^3 (55 MW plant). The World Health Organization has suggested a 24-hour ambient standard of 50 ug/m^3 as adequate to maintain protection of human health.

Radon-222 (Rn^{222}), the natural decay product of Uranium-238 (common in soiland rock but localized around geothermal reservoirs), escapes in non-condensible gases. Such gas is less than 1 percent by weight of geothermal steam and Rn^{222} is found only in trace amounts. Standards for ^{222}Rn set by the California Department of Health Services (DOHS) (Section 30355 of Title 17 of the California Administrative Code), are 100 pCi/l in air for a controlled area and 3 pCi/l in air for an uncontrolled radiation area at the point of release to the environment. Federal standards are set at 3 pCi/l for ^{222}Rn alone, and at 1 pCi/l for ^{222}Rn in combination with its daughters. These standards are for concentrations in the air above natural background radiation. Rn^{222} in steam supplying Geysers Units 1-11 (501 MW) has been measured at 1.43 Ci/day, an amount comparable to the quantity of Rn^{222} released naturally from 15 square meters of soil surface. It is not expected that the 72 MW plant proposed by Applicant will have an adverse public health impact. Nevertheless, Applicant will

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* A curie is a unit of radioactivity. 1 picocurie = 10^{-12} curie.

** Bi (Bismuth); Po (Plonium).

implement a Rn^{222} monitoring program similar to that developed by PG&E and the California Department of Health Services for Geysers Unit 17. This program is described in Appendix G of the AFC.

Other toxic or hazardous substances (anthraquinone disulfunic acid, Vanasol, sodium hydroxide, hydrogen peroxide and chlorine) are discussed in Section 6, "Safety", of this Decision.

The FJES analysis of impact on public health generally concurs with the Applicant's identification of existing pollutant levels (see FJES, pages 137-138). It also assesses current data on the human population in the vicinity of the proposed site. 1977 studies by PG&E (see "Table 18: Population Distribution in The Geysers Area" on the following page) were used as a base for demographic information. The FJES qualifies this information by noting that it does not include seasonal residents, who may triple the local population during summer.* CEC staff estimate that 22 percent of the local population could be classified as sensitive to pollutants on the basis of age (e.g., the very young and the elderly). According to the Lake County Air Pollution Control District (1980), the percentage of pollutant-sensitive people tends to increase from late-spring to early-fall.

The FJES reports that no known studies describe the existing status of public health in the vicinity of The Geysers and no reported cases of adverse public health effects clearly attribute the cause to pollutants from geothermal power plants (FJES, page 138). However, complaints alleging such causation have been received in Lake County and in 1976 a survey of 142 Cobb Valley residents indicated that 72 percent of the respondents disagreed that geothermal development would have no odor impacts.

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* For information on human receptor sites nearest the proposed site, see Section 2b "Noise" immediately following and Section 10a, "Socioeconomics-Land Use", in this Decision.

TABLE 13

POPULATION DISTRIBUTION IN THE GEYSERS KGRA

Age Group*	Area: Within 7 Miles of Units 5 & 6	Area: Within 10 Miles of Cobb Mountain	Area: Within 30 Miles of Units 5 & 6
0-5	182 (10.5%)	322 (8.6%)	14,487 (8.8%)
6-17	439 (25.3%)	888 (23.8%)	36,342 (22.1%)
18-34	335 (19.3%)	685 (18.3%)	34,715 (21.1%)
35-64	586 (33.8%)	1,321 (35.3%)	53,999 (32.8%)
65+	194 (11.2%)	521 (13.9%)	25,188 (15.3%)
Total Population	1,735	3,737	164,731
Total Area	154 mi^2	314 mi^2	2,827 mi^2
Population density (persons/mi^2)	11.3	11.9	58.3

* January 1977 ages

Source: PGandE, 1978 b

In evaluating whether the proposed project creates significant public health impacts, the FJES partially prefaced its conclusions as follows:

> "Since California Ambient Air Quality Standards (CAAQS) are based at least in part on public health protection, CEC staff believes that compliance with the standards should result in adequate protection of public health. The absence of an ambient air standard to protect public health from a given pollutant, however, does not necessarily mean that the pollutant poses no threat to human health. Rather, such absence may reflect a lack of sufficiently reliable data upon which to base a legal standard, or the considerable time required for the rule-making procedures to establish standards rather than the lack of need of concern. For example, there is no adopted ambient air quality standard for arsenic--yet arsenic and certain arsenic compounds are known toxicants and suspected carcinogens." (FJES, page 140).

On H_2S, the FJES provided a thorough examination which is incorporated in Section 2,"Air Quality", of this Decision. On the basis of previous experience with existing plants, TSP, SO_2, CO, NO_2, Oxidant, Lead, Nonmethane Hydrocarbons and Sulfates are not expected to significantly affect public health if ambient air quality standards are met. Results of monitoring Rn^{222} at Geysers Units 1-11 indicate that these emissions will meet applicable standards. For nonregulated pollutants (Ammonia, Arsenic, Benzene, Boron, Mercury, Silica, ADA and Vanadium possible impacts will be mitigated by requiring source and environmental monitoring as a condition of acceptance of information. From this approach it has been concluded that ambient concentrations of ADA and Boron should not cause adverse health impacts. There is, however, a significant probability that the project will contribute to the ambient air concentrations of arsenic, ammonia, benzene, mercury, silica and vanadium and will exceed the Multimedia Environmental Goals (MEG) suggested ambient goals.*

Thomas J. Phillips, Energy Analyst at the Commission, participated in the preparation of the FJES on the subject of Public Health impacts and testified at the hearing in support of the jointly-sponsored findings and

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* At the Environmental Protection Agency in 1977 the "Multimedia Environmental Goals" were developed as a first effort to establish a "procedural approach to evaluate and rank a large number of pollutants for the purpose of environmental assessment."

conclusions. Additionally, he submitted testimony supporting the revision of Conclusion 2c.

COMMITTEE FINDINGS AND CONCLUSIONS

Although hydrogen sulfide is discussed more specifically in Section 2 of this Decision, the Committee finds that the evidence submitted by Applicant and Staff establishes that the proposed project can be built and operated without significant public health impacts. The Applicant's agreement to provide ambient monitoring for certain non-regulated pollutants as specified in Conclusion 2d corresponds to the FJES concern for assessing the public health impact of all potentially harmful elements and ensures the project's ability to operate without creating significant environmental or public health dangers.

b. NOISE

Mr. Entrekin also prepared AFC Section 5.8 and testified in support of the jointly-sponsored conclusion and conditions.* The area in the immediate vicinity of the proposed site is either undeveloped chaparral and forest land or is devoted to geothermal development. The closest noise-sensitive receptor is a residence off Pine Flat Road, about 11,000 feet from the site. Measurements of existing noise levels to assess the potential impact of construction and operation were made at 8 locations (see Figures 5.8-1 and 5.8-2 on the following pages).** A total of 18 measurements were made over a

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* Sound levels are usually measured and expressed in decibels (dB), with zero dB corresponding roughly to the threshold of human hearing. An "A-weighted" sound level (dBA) is used that approximates the frequency response characteristics of the average human ear for various sound intensities. L_{eq} is defined as "the equivalent sound level" and is the A-weighted sound level which has the same total energy as the actual time varying sound level experienced during the measurement period. L_{dn} is called the day-night equivalent sound level and is the A-weighted equivalent average sound level during a 24-hour period with 10 dBA added to the hourly L_{eq}s during the night hours (10 pm to 7 am). L_{99} is the A-weighted sound level equaled or exceeded 99 percent of the time. AFC 5-9

** Lee Keilman, Supervising Engineer at SMUD, corrected the labelling of the figures as contained in this Decision.

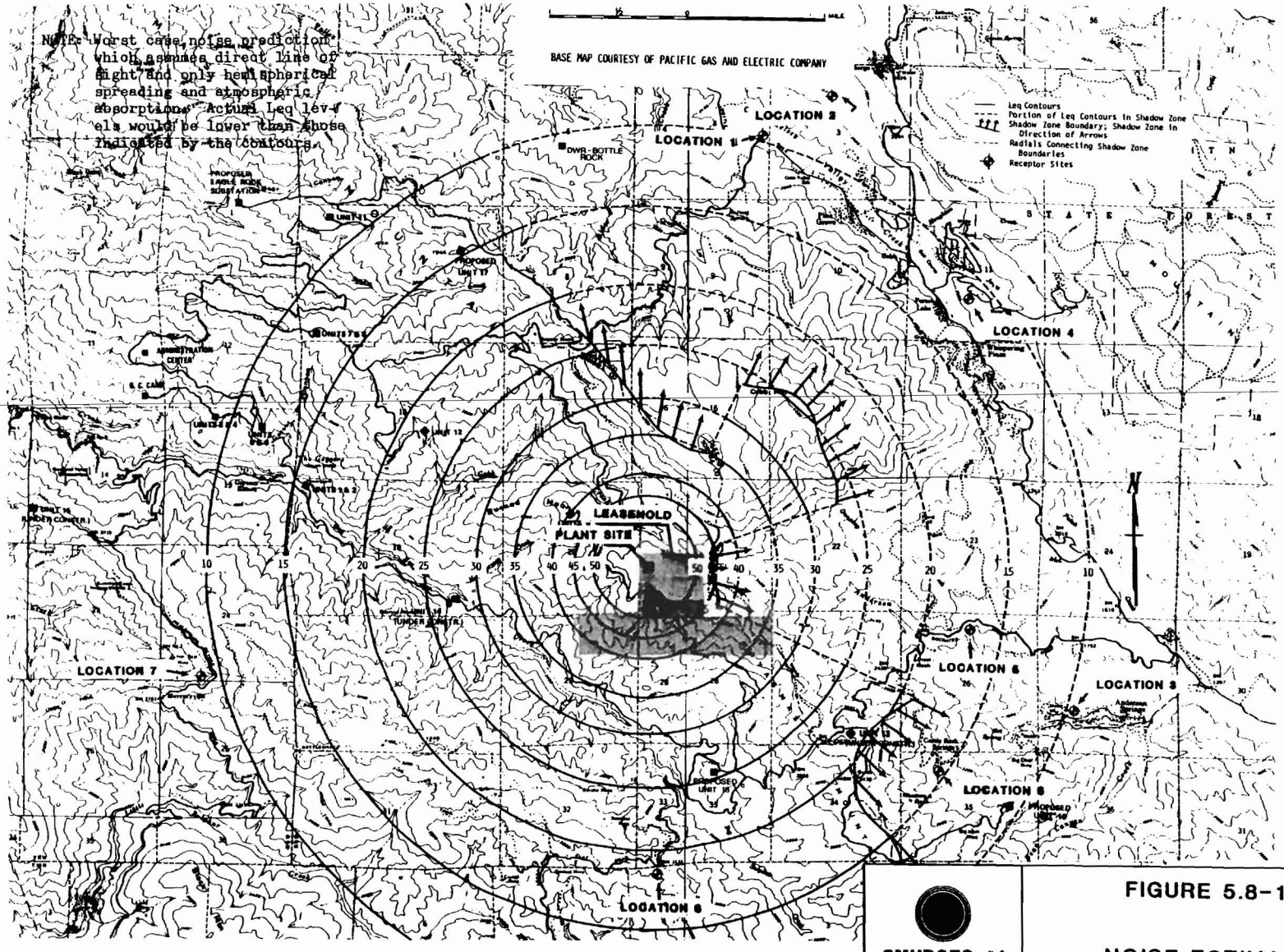

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FIGURE 5.8-1

NOISE ESTIMATES
PLANT OPERATION

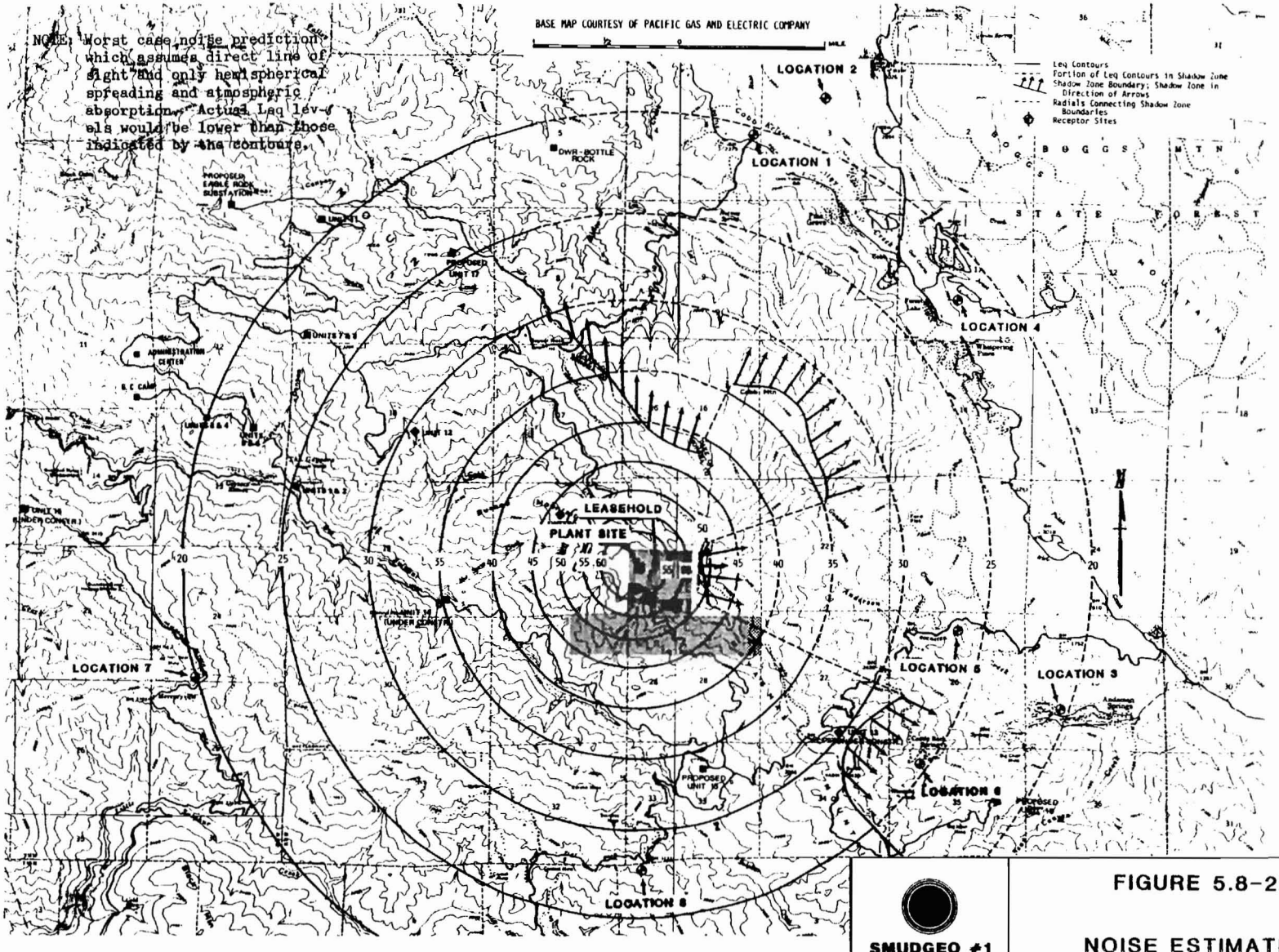

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FIGURE 5.8-2

NOISE ESTIMATES SITE PREPARATION

period of four days during daylight and nighttime hours. In addition, three 24-hour measurements were made at Locations 3, 5, and 6.*

The Sonoma County land within a five mile radius of the proposed site is designated as a primary geothermal resource area. Future uses in the area would be related to the development of geothermal resources and would not include residential development. The Lake County land is designated by the County General Plan as extensive agriculture. Lake County is currently issuing building permits for lots only in existing subdivisions. Noise measurement locations were chosen to assess impact on existing and future noise-sensitive receptors, assuming that no new homes will be built within two miles of the proposed site.

The noise environment is typical of quiet rural areas. Roadside receptor locations are influenced by traffic noise with levels ranging from about 29 dBA during quiet periods to more than 70 dBA when trucks pass.** Locations distant from roads are primarily influenced by occasional aircraft flyover, wind in distant trees, distant chain saws, and distant venting steam wells in a range from 24 dBA to 60 dBA. In the more developed communities of Anderson Springs, Whispering Pines and Pine Grove the noise environment away from major roads is dominated by local traffic, barking dogs and home maintenance activities in ranges from 32 dBA to 70 dBA.

Location 8 recorded the quietest conditions and was therefore used to evaluate worst case impacts during the maximum noise generation during power plant construction and operation.

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* Noise level projections at distances beyond 1,000 feet and across rough terrain vary greatly. Variability is caused by atmospheric absorption, temperature gradients, wind speed, wind direction and the height/width of intervening ridges and hills. Atmospheric conditions conducive to the propagation of sound were incorporated when calculating both worst case construction and operation noise.

** For comparison, the background noise level in a movie studio used for sound pictures is about 20 dBA; a soft whisper at a distance of 5 feet is about 30 dBA.

During the construction phase the loudest noise will be for site preparation. Construction traffic is estimated to average five heavy trucks and 65 automobiles/light trucks daily. Primary impact will be in the community of Anderson Springs, the Geysers Resort, and isolated residences along the access roads (see AFC Table A-3).

The U.S. Environmental Protection Agency has declared a 55 Ldn goal for rural residential environments (see: "Levels of Environmental Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety") to avoid interference with conversations. California has no standards applicable to power plant operation or construction but the Motor Vehicle Code limits noise emissions of vehicles on public roads. Sonoma County applies standards on a case-by-case basis; in the past the standard has been 65 dBA day and 55 dBA night for construction activities, and 60 dBA day and 50 dBA night for operation. Sonoma County is considering proposed standards of 65 dBA maximum (7 am-7 pm) and 45 dBA maximum (7 pm-7 am) at the nearest residential use.

During operation the major noise sources are the cooling tower, steam ejector jets, transformers, the turbine and the generator building with ranges at source from 93 to 126 dBA.

The worst case analysis predicts no significant impact from noise at local receptors:

TABLE 5.8-6

POTENTIAL NOISE IMPACTS OF CONTINUOUS PLANT OPERATION

Leq	Impact Classification	Expected Community Annoyance
30 dBA	No impact	None
30-35 dBA	Little impact	Rare expressions of dissatisfaction are expected
35-40 dBA	Some impact	Some individual comment and reaction expected, but no group action likely
40 dBA	Great impact	Strong individual comment and reaction expected, as well as group action

TABLE 5.8-7

ESTIMATED WORST CASE NOISE LEVELS
AND MINIMUM MEASURED BACKGROUND LEVELS

Locations of Nearest Sensitive Receptors		Noise Level During Construction (L_{eq})	Noise Level During Operation (L_{eq})	Minimum Measured L99
Number	Description			
1	Pine Grove near Bottle Rock Road	20 dBA	10 dBA	20 dBA
2	Hobergs overlooking Bottle Rock Road	20 dBA	10 dBA	27 dBA
3	Anderson Springs	21 dBA	10 dBA	34 dBA
4	Whispering Pines	22 dBA	11 dBA	32 dBA
5	Socrates Mine Road	26 dBA	17 dBA	38 dBA
6	Verdant Vales School, Castle Rock Springs	25 dBA	16 dBA	48* dBA
7	Mercuryville	20 dBA	10 dBA	26 dBA
8	Pine Flat Road	27 dBA	18 dBA	24 dBA

*Dominated by grading activities at location of Unit 16 site.

Before presenting the worst case analysis, Applicant pointed out that ambient noise levels represent a more reliable tool for evaluating community noise impact because of human sensitivity to changes in the noise environment. Additionally, the spectral content of noise should be considered (a description of the qualitative nature of the sound, depending on the amount of energy at a given frequency). The threshold of audibility for broadband noise (such as that generated by a power plant cooling tower) in an ambient noise environment of 25 to 30 dBA (typical of the quieter levels in the area) is about 30 dBA, similar to the sound of wind blowing through distant trees. Above 30 dBA

noise is progressively more audible and at 40 dBA noise is evident; at 45 dBA a noise becomes the dominant feature of the environment.

The worst case analysis examines noise impacts during the construction (site preparation) and operation phases. During construction the maximum anticipated sound level at the nearest residence (location 8) is estimated to be an Leq of 27 dBA and at the next nearest receptor (Verdant Vales School, Location 6) 25 dBA. Since the minimum measured ambient noise level in the area is around 24 dBA, construction noise is expected to be barely audible. During the operation phase the maximum noise level at Location 8 is anticipated to be 18 dBA and at Location 6 it is anticipated to be 16 dBA. Because of the distance between the plant and these receptors the spectrum of noise is expected to be heard as a faint rumble undistinguishable from the sound of wind in distant trees. Although steam venting will have a maximum Leq of 41 dBA at Location 8, its infrequency reduces its impact to insignificance.

Based on the measurement made 200 feet from Socrates Mine Road (Location 5), the maximum traffic-generated noise level during construction would be at about the same level (or at most, 3 dBA higher) than levels which presently exist on Socrates Mine Road. A 3 dBA increase in environmental noise is not generally perceptible, and impact would be no greater than that which presently exists due to use of the road by power plant related traffic.

COMMITTEE FINDINGS AND CONCLUSIONS

Based on the uncontested evidence presented by Applicant and Staff the Committee finds that the proposed project can be built and operated in compliance with Sonoma County's proposed standards of 65 dBA maximum (from

7 am - 7 pm) and 45 dBA maximum (from 7 pm - 7 am) at the nearest residential use (Location 8). Further, the Committee concludes that if the jointly-sponsored conditions are fulfilled this project will not create any significant noise impacts.

4. GEOTECHNICAL, SEISMIC HAZARD, STRUCTURAL ENGINEERING AND RELIABILITY

a. GEOTECHNICAL

R.P. Kitchell, Project Manager for Stone & Webster Engineering Corporation, participated in the preparation of the Applicant's geotechnical information (AFC Sections 1.3.1 and 5.5). The site is on a topographic knob with generally thin soil cover ranging from one foot at the knob to several feet on some of the side slopes. Excavation up to 40 feet from the top of the existing knob will be required to obtain a sound rock surface for foundations. Test borings were performed and the logs filed in Appendix D of the AFC. Data indicates that thrust faults pass under the site at depths greater than 400 feet (AFC 5-41); borings indicate no major movement along joints or fractures, confirming that no faults outcrop at or adjacent to the site. Based on this investigation it was concluded that the site is suitable for construction of the plant.

The FJES concurs with the geological information filed by the Applicant and concludes that "geologic hazards such as liquefaction, expansive and collapsible soils, tsunamis and seiches are not likely to occur within the leasehold."*

Kent S. Murray, Geologist in the Engineering Evaluation Office of the Commission, prepared the FJES geotechnical section and staff analysis of the AFC. He testified that he agrees with the jointly-sponsored conclusion:

1. There are no geologic conditions within the leasehold that would preclude or impair the siting of the proposed project

but noted in his filed testimony that "There are no LORS** specifically governing geotechnical design or the type of geotechnical hazard analysis which should be applied to non-nuclear power facilities."

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* The Committee assumes that the scope of this assessment reflects Staff's intent to comprehensively meet the objectives of the California Environmental Quality Act (CEQA).

** Laws, Ordinances, Regulations and Standards.

COMMITTEE FINDING AND CONCLUSION

Given the lack of standards by which to assess the geotechnical adequacy of the proposed site, the Committee can render no finding in this area; thus, the parties' proposed conclusion that there are no geologic conditions present to "preclude or impair" the project will be accepted. It should be emphasized, however, that this section also includes consideration of seismic hazard and structural engineering impacts in the following pages.

b. SEISMIC HAZARD

R.P. Kitchell directed preparation of a report, "Seismic Evaluation, SMUDGEO No. 1", (AFC Appendix B) which was presented to support the proposed findings and conclusions. The report examined the following regional and site-specific seismic information:

- a map of regional active and potentially active faults;*
- a review of historic earthquake date;
- development of recurrence curves for faults capable of affecting the site;
- estimates of maximum credible earthquakes (MCE) and 100-year, 60-year and 40-year recurrence earthquakes for selected faults; and
- estimates of MCE and 100-year, 60-year and 40-year return period bedrock accelerations at the site for the selected faults.

The scope of the work was amended to reflect the seismic model suggested by Staff at a workshop held October 25 and 26, 1979.

1. The plant will be located in a known seismically active region, but the site has no indications of containing active or potentially active faults.** Seismic effects are limited to ground shaking from the San Andreas, Healdsburg-Rodgers Creek and Maacama faults.

* See Figure 5.5-4, "Regional Quarternary Fault Map", at page 30.

** A potentially active fault is defined as one which has moved during the Quarternary Period (last two million years), but not during the Holocene Epoch (last 11 thousand years) (Hart 1977).

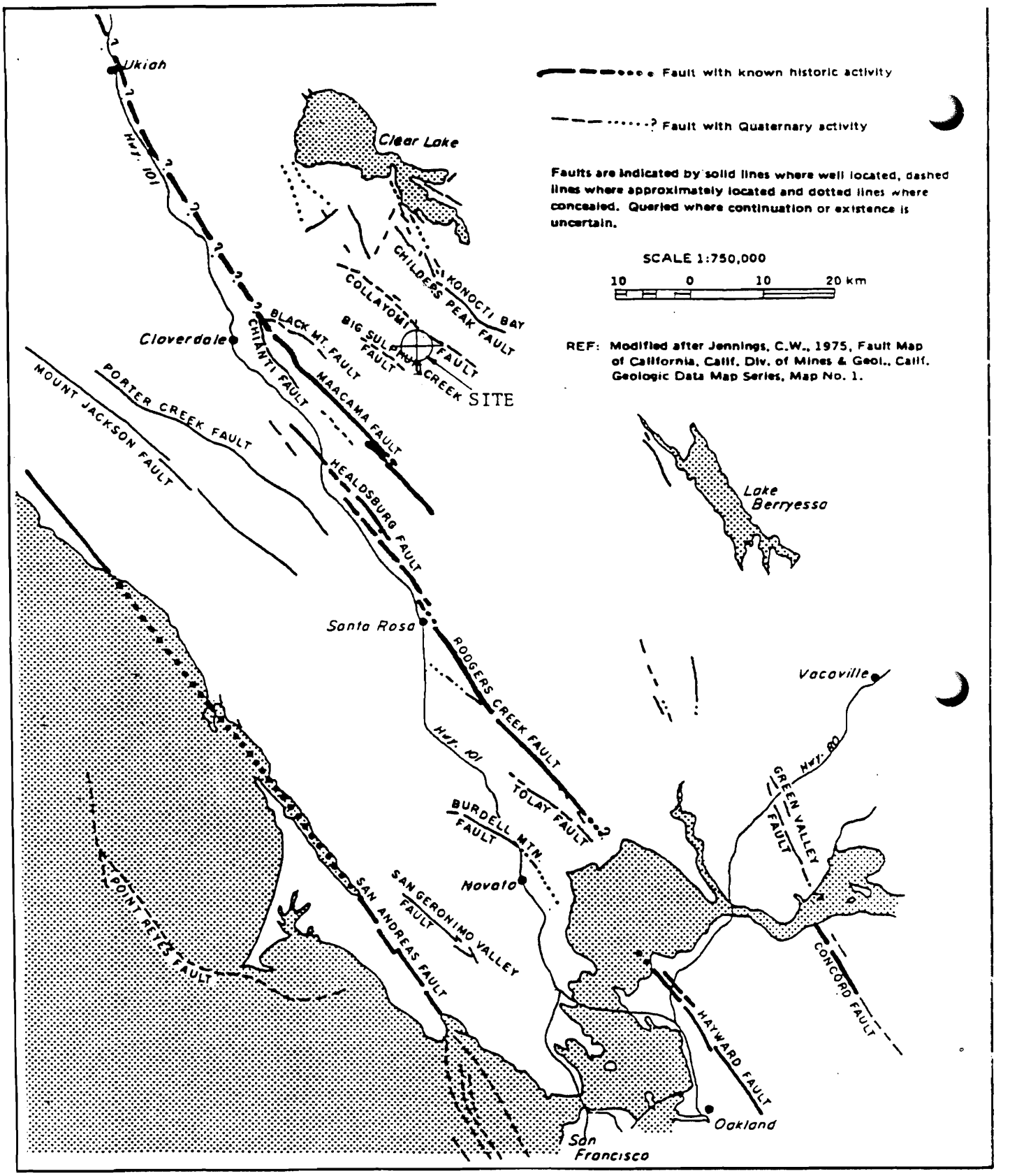

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FIGURE 5.5-4
REGIONAL QUATERNARY FAULT MAP

The report cautions that prediction of earthquake magnitude and recurrence from historic data is partly speculative and open to interpretation. It explains that the historic record is very short and further limited by the implementation of seismological instrumentation for only the last 40 years (in the Clear Lake region seismographs have only recently been installed). Thus, statistical analysis of poorly documented faults may yield meaningless results (AFC Appendix B, page 6).

Using technical assumptions,* the following information was developed:

CHART ONE

FAULT	100-year Interval Earthquake	Maximum Credible Earthquake	Recurrence Interval for MCE
San Andreas	7.8	8.3	100+ years
Healdsburg-Rodgers Creek	7.25	6.8	85 years
Maacama	3.6	6.5	240,000 years
Collayomi	4.5	6.5	660 years
Konocti Bay-Childers Peak	3.5	6.4	24,000 years
Porter Creek	2.3	6.7	170,000 years
Mount Jackson	5.25	6.9	300 years
Big Sulphur Creek	2.9	5.6	1,500 years
80 km radius	7.7		----------

* The recurrence and magnitude estimates are partly based on Figures 4-A through 4-I, AFC Appendix B. The 100-year interval earthquake was determined from the appropriate recurrence and magnitude curve for each fault by dividing the period of record (120 years) by 100 years. This value is then the ordinate corresponding to the abscissa for the 100-year return period earthquake magnitude on the same recurrence and magnitude curve. The MCE was determined from the rupture length/magnitude curves derived by Mark (1977) by assuming that the maximum rupture length on any fault is equal to one-half the total fault length. The recurrence interval for the MCE is then determined from the recurrence and magnitude curves by dividing the period of record by the ordinate value corresponding to the earthquake magnitude.

Recent work by D.G. Herd (1976, 1977 and 1978) not incorporated above, suggests that the Hayward-Lake Mountain Fault System, which includes the Maacama and Healdsburg-Rodgers Creek faults, is an intracontinental plate boundary. Such boundaries are highly seismic. Based on the mechanics of plate motion the Hayward-Lake Mountain system seems to be preferred for strain release north of Hollister, California over the San Andreas Fault. This view suggests a higher degree of activity for the Maacama Fault than indicated above.

Chart One is regarded as having a "purely statistical" value and the report interprets its data in light of the regional tectonic framework, from which the following recurrence and magnitude estimates are presented:

CHART TWO

FAULT	100-year Interval Earthquake	MCE	Recurrence Interval for MCE
San Andreas	8.25	8.3	100+ years
Healdsburg-Rodgers Creek	6.5	6.8	85 years
Maacama	6.0	6.75	240,000 years
Collayomi	4.5	6.5	660 years
Konocti Bay-Childers Peak	4.0	6.4	24,000 years
Porter Creek	4.0	6.7	170,000 years
Mount Jackson	4.0	6.9	300 years
Big Sulphur Creek	3.0	5.6	1,500 years
80 km radius	7.7		----------

The source model proposed by the CEC Staff uses the San Andreas, Rodgers Creek* and Maacama faults and a "local" event occurring within a 5 km diameter circle centered on the production area. Suggested MCE magnitudes

* Staff model assumes that the Rodgers Creek fault will act independently from the closely associated, but apparently less active, Healdsburg fault.

are 8.3, 6.5, and 6.75 respectively; the "local" event having a suggested 100-year recurrence earthquake of 5.0.

2. The major factors affecting seismic response at a site are:

- earthquake magnitude*
- distance to the causative fault*
- regional topography
- local topography
- soil amplification.

Assessing the effects of regional topography to a degree relevant to engineering design is economically prohibitive at the current level of technology. The effects of local topography, according to Professor John Lysmer of the University of California at Berkeley (who has conducted a theoretical analysis for Cooper & Clark in the Northern California Power Agency Geothermal Power Plant Project), are expected to cause less than a 10 percent variation in maximum rock accelerations. The Lysmer report** evaluates bedrock motion beneath the site, the CEC source model and recurrence and magnitude curves to produce the following estimations:

CAUSATIVE FAULT	San Andreas	Rodgers Creek	Maacama	Local
MCE	8.25	6.5	6.75	5.0
Distance to Site (km)	52	35	13	5
Approximate Peak Horizontal Bedrock Acceleration at Site (g)	0.27	0.10	0.27	0.27
Approximate Peak Vertical Bedrock Acceleration at Site (g)	0.18	0.07	0.18	0.18

* Discussed in section b.1, immediately preceding.

** Applicant did not review or comment on this document.

The 100-year, 60-year and 40-year return period figures are contained in AFC Appendix B, page 21.

The FJES states that earthquake shaking and landslides could potentially damage the power plant and related facilities (FJES, pages 13-14). Earthquake shaking, however, is not seen as a significant risk in that structural design can withstand such phenomena and "staff believes it unlikely that faults within The Geysers steam field will produce any large damaging earthquakes due to either natural or induced activity during the economic life of the proposed facilities." (FJES, p. 14). Design criteria will ensure that the power plant will be inoperative for only one week from a peak bedrock acceleration of 0.15g; and for one year from a peak acceleration of 0.28 g. The probability of peak accelerations during the 30-year facility lifetime is about 27 and 5 percent, respectively. (Appendix A, p. A-27) Location of the plant site on bedrock is considered a reasonable mitigation against landslide damage.

Gaylon Lee, Energy Facility Siting Planner at the Commission, reviewed the Applicant's AFC section and data responses on seismic hazards, and prepared a staff position paper (attached to the Seismic Hazards section in Appendix A). As much of Staff's focus in this area involved the model presented at the October 25 and 26, 1979, workshop, and such was accepted and largely incorporated in the Applicant's work, he believes that the plant will neither create nor be subject to unreasonable seismic hazards. At the February 5, 1981, evidentiary hearing revisions were made to the Seismic Hazards section (and incorporated in the section at Appendix A) without objection.

COMMITTEE FINDINGS AND CONCLUSIONS

Evidence presented has been characterized by the witnesses themselves as "speculative and open to interpretation," possibly producing "meaningless results". This does not mean that an inadequate assessment of seismic

hazards exists; rather, it reflects--as noted in the reports and testimony recorded-- that such investigations are limited by the scarcity of historical data and the relative newness of technical instruments to conduct adequate measurements. The question addressed by the Committee is similarly superficial: from a viewpoint of seismic hazard, is the Applicant's proposed project "too risky"? The answer, more than with other areas being examined, is necessarily judgmental. Based on the substantial information presented in the AFC and Staff Workshop, the Committee finds that seismic hazard does not pose such a threat to the proposed project that it should be disapproved. Further, the risk of seismic disturbance is reasonable for the Applicant to bear provided that the design requirements and sloping specifications to be discussed next in the "Structural Engineering" section are implemented.

c. STRUCTURAL ENGINEERING

For the Applicant, R.P. Kitchell introduced revised findings, conclusions and conditions to support a Committee determination that the proposed plant and related facilities can be constructed and operated without significant adverse environmental impacts in compliance with applicable standards.* Mr. Kitchell participated in the preparation of the AFC Section 1.3.1 and its Appendix C: "Structural Design Criteria". The Appendix contains detailed information describing the Applicant's efforts to meet the standards and specifications of:

- Uniform Building Code, 1979 edition;
- Occupational Safety and Health Act, May 29, 1977;
- Building Code Requirements for Reinforced Concrete (American Concrete Institute (ACI) 318-77) Section 8.1.1, strength design;

* Staff's witness, Gaylon Lee, also introduced some revisions to the filed findings, conclusions and conditions. In each case the revisions were accepted without objection during the evidentiary hearing on February 5, 1981, and have been incorporated without comment in Appendix A.

- Specifications for Structural Concrete for Buildings (ACI-301-72);
- American Institute of Steel Construction (AISC): Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, November 1978; Code of Standard Practice for Steel Buildings and Bridges, September 1976;
- American National Standards Institute (ANSI): Building Code Requirements for Minimum Design Loads in Buildings and Other Structures (ANSI A58.1-1972);
- American Welding Society (AWS): Structural Welding Code (AWS D1.1-79); Reinforcing Steel Welding Code (AWS D12.1-79); and
- American Association of State Highway Officials: Standard for Specifications for Highway Bridges, 12th Edition, 1977.

All structures will be designed with an horizontal ground acceleration value of 0.27 g. The turbine, turbine anchorage and turbine support pedestal will be designed for a peak horizontal acceleration of 0.41 g.

According to AFC section 1.3.1, excavation from the top of the knob on the site will extend up to 40 feet so that all foundations of major structures and equipment are on a sound rock surface. Slopes at the site and along the access road will have a 2:1 and 1.5:1 horizontal to vertical ratio for fills and cuts, respectively. Foundations will be constructed of reinforced concrete; all structures will be steel framed.

Staff presented two witnesses in support of the proposed findings, conclusions and conditions in the area of structural engineering: Darrel "H" Woo, an Energy Facility Siting Planner who has worked at the Commission since 1976, and Robert Thacker, a civil and structural engineer with the California Office of State Architect. The witnesses divided responsibility for sponsoring the evidence: Mr. Woo testifying in support of the reliability of Applicant's proposed design and Mr. Thacker joining to support all the other findings, conclusions and conditions. Under cross-examination on

Conclusions 1 and 2, Mr. Woo explained that determination of "adequacy" necessarily assumes risk factors but that such are justifiable and acceptable. Mr. Thacker explained that from an engineering view the data provided by SMUD is inadequate to analyze equipment reliability (RT 604). However, he agreed that the cooling tower and Stretford column have adequate structural integrity to meet functional basis earthquakes. He emphasized that independent engineering review and control of the project during the design and construction phases will be much more important than the certification review of proposed criteria (RT 608-609).*

COMMITTEE FINDINGS AND CONCLUSIONS

Based on the presentations from Applicant and Staff the Committee finds that the proposed structural engineering design criteria are adequate to meet applicable law and Commission-identified standards necessary to ensure safe and reliable construction and operation. While the reservations of the Office of State Architect are mentioned here and preserved on the record, it is the Committee's understanding that those concerns will be addressed and monitored during the post-AFC phase. Approval with such assumption is considered proper, especially in light of the on-going evaluation required by Conclusion 3 and the specific mechanism developed to assess "substantial changes" (see Appendix A, Structural Engineering section, p. A-28).

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* In response to Thacker's concern Staff agreed to send a copy of the Compliance Monitoring Report (Appendix D, under separate cover) to the Office of the State Architect for review and comment. At the March 18, 1981, Committee Conference Staff reported that the Office of the State Architect had no comment on the Compliance Monitoring Report. Staff repeated its position, "regarding independent engineering review and control during design and construction of this type of facility (that it) should be delegated to the local agencies, who typically have responsibility for this work, or to the Applicant, who has a vested interest in assuring the facility is designed and built consistent with the approval criteria." (Letter from J. Wazlaw to Hearing Officer, 3/17/81).

d. RELIABILITY

Inquiry at this point focuses on whether the proposed facility will operate with the frequency and capacity levels stated by SMUD.

Paul V. Kleinhans, Project Engineer with Stone & Webster Engineering Corporation, prepared AFC section 7 and testified in support of the jointly-sponsored conclusions and condition (see Appendix A). The plant is designed to generate power at a 90 percent availability rate, with an operating capacity factor of 80 percent. Maximum availability and spare capacity will be planned where feasible. The system uses equipment with a historical record of satisfactory service and plant design which is similar to others in The Geysers KGRA. External hazards to plant reliability (seismic events, geological instabilities, floods, meteorological conditions and climatic extremes) are discussed in other sections of this decision and mitigation measures will be implemented to minimize their impact.

In addition to design with built-in spare parts to maintain reliability, some features are being installed to increase reliability: two 100 percent capacity condensate pumps, two 100 percent capacity air compressors, two 100 percent capacity turbine lube oil coolers, two parallel generator hydrogen coolers, and a circulating water piping system with a cross-tie so that both condenser water boxes can be fed from either circulating water pump. A spare turbine rotor will be on site to minimize the down-time required for repair. Although designed for baseload operation, the plant will also be capable of operating at reduced capacity. Regular inspections and preventive maintenance procedures are planned to minimize unscheduled interruptions.

Darrel "H" Woo, Energy Facility Siting Planner with the Commission, reviewed Applicant's plans and found them sufficient to support the proposed conclusions

and condition. He introduced Staff's analysis of this area and pointed out that there are no standards or regulations requiring a particular level of reliability but that the Commission does examine such questions in light of a December 1979 Staff Report, "Issues Related to the Reliability of Power Plants in California", which identifies reliability as a form of energy conservation to reduce future need and depletion of resources.

COMMITTEE FINDINGS AND CONCLUSIONS

The Committee finds on the basis of evidentiary presentations that the proposed project will be built to meet the Reliability standards recommended by the Commission.

5. WASTE MANAGEMENT

George Domahidy, Process Engineering Supervisor at Stone & Webster, prepared the Applicant's AFC section on Solid Waste Management and testified in support of the jointly-sponsored findings, conclusion and conditions (see Appendix A, Solid Waste Management section).

Liquid waste was categorized in four types:

- leaks, spills, floor and equipment drains, and storm runoff to controlled areas;
- storm runoff from the remainder of the plant site;
- sanitary treatment of plant effluent; and
- excess condensate.

AFC Figure 1.3-11 (included on the following page) diagrams the disposal system for the first three waste types. The plant will not directly discharge wastes to Big Sulphur Creek or its tributaries. At the cooling tower 50 to 75 percent of all of these wastes (including condensate) will evaporate. Excess waste water and condensate will be reinjected into the geothermal steam field by Aminoil (AFC, page 5-31), the steam supplier.

The system's capacity may be exceeded up to two times annually during intense and heavy rainfall. However, impact should be minimal because the first slug of storm water collected in the system each year will contain nearly all dust and salt deposited during the dry periods; excess storm water circumventing the system should be similar to storm water runoff from nearby natural areas. Nevertheless, such water will be channelled to a sedimentation check dam system below the site before discharge to Cobb Creek. Due to these measures, liquid waste will not have any significant impact on water quality (AFC, page 5-32).

Three sources of solid waste have been identified:

- solids produced by the sanitary sewage treatment plant;

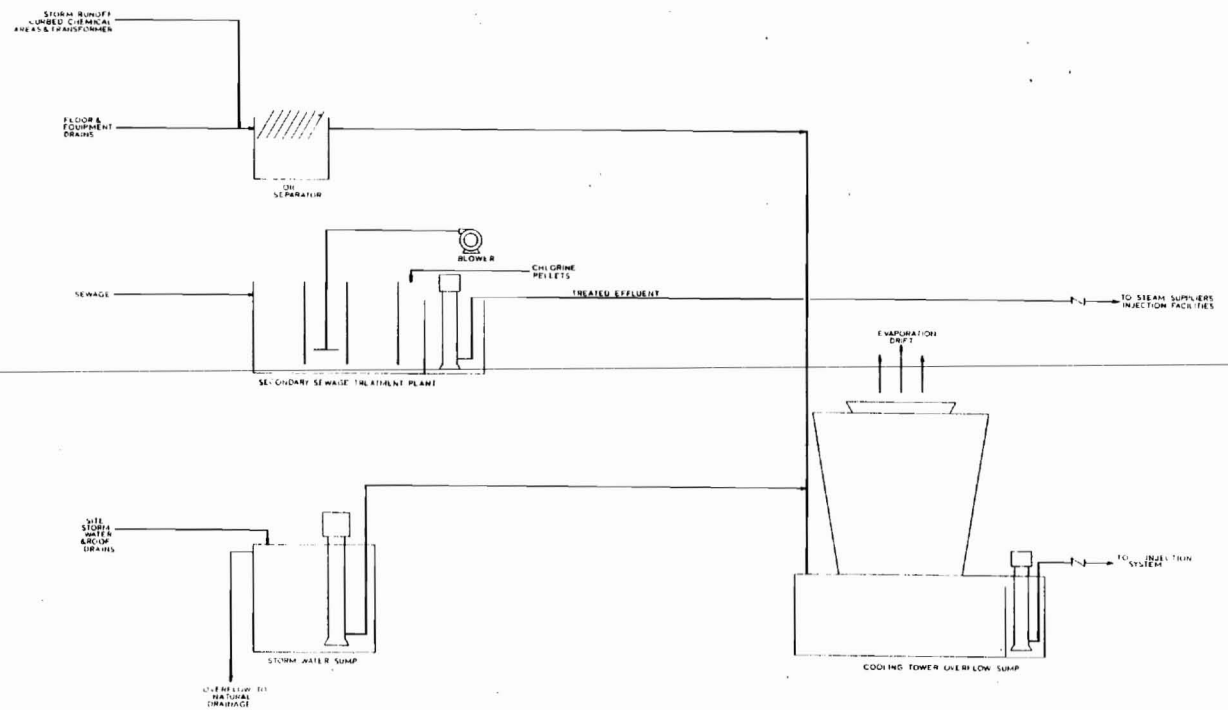

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FIGURE 1.3-11

LIQUID WASTE DISPOSAL SYSTEM

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- solids removed from the cooling tower during maintenance; and
- sulfur produced by the Stretford system.

These waste materials will require disposal at approved sanitary landfills; possibly the Applicant will sell the sulfur. Applicant and Staff filed joint finding number 9 for the evidentiary hearing which states:

> "At the moment, it is unclear which site or sites the Applicant will use to dispose of wastes generated. Accordingly, it is necessary for the Applicant to inform the commission which site(s) is (are) selected for toxic waste and construction waste disposal."

After the January 12, 1981, Prehearing Conference the Committee ordered Applicant to "clarify what alternative disposal sites, if any, will be used if SMUD is unable to confirm its planned contract. If the contract is confirmed, that information shall be reported to the Committee." In response, the Applicant submitted correspondence from Geothermal Inc. and the IT Corporation indicating that both would entertain contract negotiations. Under cross-examination by James Botz, Sonoma County Counsel, Applicant's witness confirmed that Applicant is negotiating a solid waste disposal contract. The Committee explained to Applicant that some concern is developing among counties in the Geysers area about the uncertainty of waste disposal contracts during the pre-operational phase of geothermal power plants and that while the tentative nature of contracts for prospective services is understandable, a specific provision to accomodate this concern might be developed in the Commission's Compliance Monitoring Program.

Gaseous wastes are discussed in Section 2, Air Quality.

The FJES evaluated the waste management techniques proposed by SMUD in light of observed impacts from operations by PG&E and against the regulatory standards developed by the California Department of Health, U.S. Environmental Protection Agency and the Water Quality Control Board. Drilling wastes, cooling tower sludge and the sulfur produced by the Stretford process are

considered hazardous by the California Department of Health Services. During the 32-month construction phase approximately 3,500 cubic yards of waste will be produced that cannot be stored on-site without significant aesthetic, biological and water quality impacts (FJES, p. 81). During operation an unestimated amount of waste requiring disposal will be produced from the Stretford and secondary H_2S abatement systems (see Section 2b Air Quality).*

The FJES notes that numerous federal, state and local laws regulate the safe handling of toxic waste materials and the producer is responsible for disposal, even after delivery to the hauler. The assessment concludes with a description of cumulative waste impacts:

> "Approximately 2,000 cubic yards of sludge (waste from water processing systems at PG&E Geysers Unit 3, 4, 5, 6, and 11, and waste from cooling tower basins at Units 1-11) per month is presently disposed of at a site near Middletown in Lake County. This site is owned by Geothermal, Inc., and is estimated to have a 50-year capacity to accept wastes at the current production rates.** In addition, IT Corporation owns several sites which can dispose of these wastes (Kritikos, 1979, Simonsen, 1979; Central Valley RWQCB, 1979). SMUDGEO #1's Stretford system will produce approximately 350 cubic yards of sludge per year, and the H_2O_2 secondary abatement system may produce as much as 3.5 cy of sludge per year. The cumulative impacts of geothermal wastes will affect the capacity of the waste disposal site, but if disposed properly, the adverse effects upon water quality and public health will be mitigated." (FJES, p. 85).

Martin Homec, Energy Facility Siting Planner, testified on behalf of Staff in support of the proposed findings, conclusion and conditions, and explained that he participated in their preparation as well as the development of the FJES section on Waste Management.

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* Using a surface condenser and Stretford system for H_2S abatement the 110 MW PG&E Geysers Unit 17 geothermal plant is expected to produce approximately 125 cubic yards of sludge annually (20 percent solids, 80 percent water). The PG&E Geysers 16 AFC estimates 80 cubic yards of sludge weekly (40 percent solids, 60 percent water) from secondary abatement.

** On January 23, 1981, W.T. Kritikos, Vice-President of Geothermal Inc., wrote to Lee Keilman of SMUD, "For a discussion of Site Capacity at Butts Canyon, please refer to page 4 in your enclosed copy of the report . The 75 year capacity projected is quite conservative in that it assumes the following:
No future land acquisition by Geothermal Inc.
No recycling of H_2S abatement Sludge or Drilling Mud.
No development of upstream abatement technology."

COMMITTEE FINDINGS AND CONCLUSIONS

The Committee adopts the uncontested findings, conclusion and conditions (see Appendix A, Solid Waste Management Section) submitted jointly by the Applicant and Staff and re-emphasizes its concern in finding number 9 that contractual arrangements for off-site waste disposal be confirmed as early as possible. Because the Committee realizes that requiring immediate arrangements may be premature, Condition number 1 is not amended. However, the Committee considers continued scrutiny of this issue important and orders the Compliance Audit Unit of the Commission to maintain periodic contact with the Applicant to ensure that adequate waste disposal arrangements are made before plant operation.

Although the issue of cumulative waste impacts was not raised during the evidentiary hearing, the Committee has noted the FJES comment to encourage Staff to present the issue of geothermal waste disposal to the OIH proceeding scheduled this summer.

Finally, the Committee concludes that the Applicant can construct and operate its plant, subject to the conditions specified in Appendix A, in a manner which avoids significant adverse environmental impacts from liquid and solid waste.

6. SAFETY

In this section the Committee examined the issue of safety for plant personnel and the general public.

P.V. Kleinhans prepared AFC sections 1.3.10 and 6.1.10 and testified in support of the jointly-sponsored conclusions and conditions (Appendix A, Safety section). AFC section 1.3.10 describes the fire protection systems designed to meet Factory Mutual guidelines and the applicable standards of the National Fire Protection Association (NFPA):

1. The plant yard will have hydrants, fully-equipped hoses and connections to serve interior and exterior systems. The hydrants will be served by buried pipe distribution systems taking water from the circulating water system. Two turbine fire pumps, each having 1,000 gallons per minute discharge capacity at 100 psig, will draw water from the cooling tower basin to serve the plant; one driven by a 460v electric motor and one by a diesel engine.

The turbine building will be protected with a dry pipe preaction-type sprinkler system for the areas below the operating floor and turbine generator and twenty feet in every direction. This system will also cover areas of the hydrogen seal oil equipment, lube oil reservoir, coolers and transfer pumps. The generator will have an automatic CO_2 purge system. The relay room will be protected by a Halon 1301 system. Portable CO_2 fire extinguishers will be located in the control room. Interior hose stations with 75 feet of neoprene lined hose and adjustable spray nozzles will be located throughout the plant.

The main and station service transformers will be protected by automatic deluge water spray systems. The administration/service building and warehouses have hose stations. The cooling tower fill will be of fire retardant construction. The support structure will be made of wood.

2. AFC Section 6.1.10 describes handling of certain toxic or hazardous substances (see Section 3 of this Decision for discussions regarding Hydrogen Sulfide, Sulfur Dioxide, Sulfates, Total Suspended Particulates, Ammonia, Mercury, Arsenic, Boron, and Radon-222). The compounds used in the Stretford unit and the condensate treatment system are: anthraquinone disulfuric acid (ADA), Vanasol (Sodium ammonium polyvanadate, 38.5 percent vanadium), sodium hydroxide (stored as 25 percent solution), hydrogen peroxide (50 percent) and chlorine. A separate chemical storage building or steel tanks next to the Stretford system will house these materials in steel drums or heavy duty water impervious bags. Hydrogen peroxide will be stored in aluminum tanks. Chlorine will be stored in an industrial high pressure storage cylinder.

ADA and Vanasol are the most uncommon substances to be used and stored on site. ADA has been used rather extensively in the dyestuff industry and no hazard to human health due to use has been reported.* Vanadium compound dust has been known to irritate human respiratory systems but Vanasol has been used in Stretford units for more than ten years without record of acute or chronic illness being attributed to it. While no standard for drinking water content of vanadium has been established, the Applicant intends to maintain the level below the 6.8 ug/m^3 (24 hours) point suggested by an Environmental Protection Agency-sponsored panel of public health experts.**

Licensed transportation companies will deliver and remove all toxic and hazardous materials.

3. During the construction phase all workers will be protected by an Accident Prevention Program required by Cal/OSHA (Title 8, California Administrative Code, Section 3203). During the operational phase, personnel

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* ADA has also been used in the last ten years in Stretford units without recorded hazard to humans.

** See: Wilcox, S.L. 1973. "Presumed Safe Ambient Air Quality Levels for Selected Potentially Hazardous Pollutants," The Mitre Corp., Contract No. 68-01-0428.

training will be augmented by design features such as the water deluge systems on electrical and oil equipment, overload protection systems on electrical equipment, hot pipe and equipment insulation, devices for the abatement of noncondensible gases and protective circuits in electrical installations.

The FJES assessed impacts on public health and safety together (see "Health and Safety", FJES pages 137 through 154) and the discussion treating public health has been discussed in section 3 of this Decision. As to worker health and safety the FJES focuses on the hazards from exposure to toxic and potentially carcinogenic chemical compounds associated with geothermal steam and H_2S abatement systems (e.g., H_2S, ammonia, ^{222}Rn, mercury, arsenic, boron and abatement system chemicals). Extended exposure to such material may result in dermatitis, acute chemical poisoning, chronic illnesses and, potentially, cancers.*

The FJES highlights the inspection program conducted by the California Division of Safety and Health (DOSH) as a device for ensuring continued protection of personnel at the plant but notes that such inspections depend on worker complaints to initiate an inspection.

Darrel "H" Woo, Energy Facility Siting Planner, testified in support of the proposed conclusions and conditions in the area of Safety. In addition, he filed extensive testimony recording the analysis he conducted to reach his position. In addition to the DOSH inspections arising from worker complaints, he points out that DOSH has authority to make random inspections.

COMMITTEE FINDINGS AND CONCLUSIONS

In light of the joint presentations from Staff and Applicant, the Committee accepts the conclusions and conditions in Appendix A as sufficient to avoid

* See FJES, Appendix B, evaluation of nonregulated pollutants, pages 251 through 256.

significant impacts on worker safety. It should be noted that with respect to safety concerns for the general public, most of the relevant discussion is contained in the Public Health section of this Decision.

7. CIVIL ENGINEERING

The Committee examined whether the Applicant's plans comply with grading and site development standards.

R.P. Kitchell participated in the preparation of the Applicant's AFC submittal describing the plant's design and operation (AFC Section 1.3.1) and testified in support of the jointly-sponsored conclusion and condition. The proposal is based largely on the geotechnical information contained in Appendix D of the AFC. (See Committee analysis in section 4: "Geotechnical, Seismic Hazard, Structural Engineering and Reliability" of this Decision). Slopes at the plant site and along the access road will be constructed with slope ratios of 2:1 for fills and 1.5:1 for cuts. All slopes will be designed with surface contours and underdrains as required to facilitate good drainage and inhibit erosion.

Marco Farro, Civil Engineer at the Commission, reviewed Applicant's civil engineering information, participated in preparation of Staff's analysis of this area and testified in support of the jointly-sponsored conclusion and condition. In his descriptive analysis, Mr. Farro stated:

> "Site development would require approximately 6.9 acres of level area and is accomplished by a cut of 180,000 cubic yards and a fill of 71,000 cubic yards. 107,000 cubic yards would be used by the steam supplier for development of well pads. The area required and the amount of cut and fill involved are reasonable for (a) geothermal project in the Geysers area, and the cut and fill slopes are accepted engineering design practices.
>
> The foundation for all major structures will be supported on sound rock with negligible settlement. All foundation will be constructed with reinforced concrete following the requirements of UBC and building code requirements for reinforced concrete (ACI 318-77).
>
> The plant site is accessible from the west via Healdsburg-Geysers Road to Geysers Resort and then past Geysers 14 to the fire road. From the east, access is from Middletown via Highway 175, Socrates Mine Road, and a fire road on Lake/Sonoma County line. Socrates Mine Road and Healdsburg-Geysers Road are county maintained and SMUD should negotiate with Lake and Sonoma County for improvement and maintenance costs.

> The applicant has proposed a design to widen, in parts, and pave the above-mentioned fire road. The improvements on this road will facilitate the flow of construction traffic as well as alleviate dust problems from vehicles, decrease erosion and sediment transport." (pages 3-4, Staff Analysis attached to Civil Engineering Section, Appendix A).

Because improvement and maintenance of the Healdsburg-Geysers Road have been the subjects of negotiation between the County of Sonoma and Applicant, their mitigation is discussed in Section 8,"Socioeconomics", of this Decision.

COMMITTEE FINDING AND CONCLUSION

Based on the evidentiary presentations of Applicant and Staff, including the geotechnical report (Appendix D of the AFC), the Committee finds that the proposed project can be built and operated in compliance with applicable standards, laws and ordinances governing the area of civil engineering.

8. SOCIOECONOMICS

a. LAND USE AND VISUAL AESTHETICS

Applicant and Staff testimony supported the jointly-sponsored conclusion on land use and the conclusion and condition on visual aesthetics (RT 665-674 and 707-708). The proposed plant will not impact land use because the area is designated for geothermal development in the General Plan and zoning regulations of Sonoma County. The location of the plant, however, will be the first in The Geysers Area in direct view at a distance. Applicant's witness testified that the site will be visible from Santa Rosa on an extremely clear day. This impact can be mitigated by the painting of the facility to blend with the natural background.

COMMITTEE FINDINGS AND CONCLUSIONS

Based on Applicant and Staff's evidence and the county's designation of the area for geothermal development, the Committee finds that no adverse land use impacts will occur as a result of the construction and operation of the proposed power plant and related facilities.

Concerning visual aesthetics, the SMUDGEO #1 plant will be the first geothermal facility in The Geysers Area visible from distant locations. To mitigate this impact the Committee approves painting the facility to blend in with its natural background.

b. GROWTH INDUCING IMPACTS

1. Housing

Applicant's witness estimated that peak-level employment (last quarter of 1982) for SMUDGEO #1 will be 125 workers, which includes 85 workers already in the area. The 40 new workers are expected to locate equally in Sonoma and Lake Counties. Transportation will be the greatest impact and mitigation is proposed with a vanpool system to encourage workers to locate in Sonoma County. This system has been established with the Swinter and Walberg Construction Company.

Applicant's witness agreed with the Director of the Sonoma County Housing Authority that Healdsburg, Geyserville and Cloverdale have very limited housing supplies, but estimated that the 9.6 percent vacancy rate in Sonoma County listed in the preliminary 1980 census figures is enough to accomodate the additional 20 workers.

Under cross-examination by Sonoma County Counsel, Applicant's witness agreed that the Census Bureau's vacancy rate probably includes second homes* (RT 684). He also stated that it is difficult to believe that Sonoma County has a shortage of home sellers in proportion to an overabundance of buyers. He was not familiar with the ratio between renters and landlords in the area.

At the February 5, 1981 hearing, Sonoma County presented the following proposed findings:

1) Housing for both the temporary and permanent work force anticipated as necessary for the construction and operation of SMUDGEO #1 is not available under current housing conditions in Sonoma County.

2) The influx of this additional work force will compound the current housing shortage in Sonoma County.

3) A reasonable mitigation measure for this condition would be for SMUD to proportionally contribute financially to and participate in a program designed to provide adequate housing in Sonoma County for income groups such as construction workers as defined by the U.S. Department of Labor's published "wage rate determinations".

The Executive Director of the County Housing Authority testified that after checking records at the Housing Authority, Multiple Listing Service, and consultation with city officials working on vacancy and availability rates, Sonoma County does not have available housing for the proposed project's work force and such influx will compound the current shortage. (RT 754).

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* A dwelling maintained in addition to the owner's primary residence.

She testified that the vacancy rate in Healdsburg is 3 percent for multiple units within the city limits and approximately 2 percent in Cloverdale.

The Executive Director testified that the workers attracted to the area will not be able to afford current housing and that the Applicant should therefore be required to provide mitigation. She conceded, however, that if enough time were available prospective residents may be able to find housing in Sonoma County. (RT 761).

Under cross-examination the Executive Director clarified that the lower vacancy rates found by the county do not reflect homes being sold by their owners. Additionally, she stated that she is not certain when the vacancy rate of 3 percent in Healdsburg was measured.

The Executive Director could not distinguish between housing shortage impacts due to geothermal development and problems generally reflecting the state's housing market, and acknowledged that the problem of housing shortages is fairly common throughout California. (RT 779-780).

The Final Joint Environmental Statement (FJES) released in February 1981, notes that Sonoma County has grown moderately (3.2 percent) since 1970, primarily due to spillover from the San Francisco Bay Area. Population growth in the geothermal area has been more modest (Healdsburg: 2.6 percent; Cloverdale: 2 percent). Because the SMUDGEO #1 proposal is one of eight proposed projects* the FJES recommends that growth inducing impacts be treated on a regional rather than site-specific basis.

The FJES predicts that the proposed project will exacerbate the housing situation in Sonoma County but that the impact from SMUDGEO #1 will not be

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* Other proposed or approved projects are: PG&E Units 16-18, Northern California Power Agency Units 1 and 2, and California Department of Water Resources' Bottle Rock and South Geysers.

substantial. (FJES 168). This conclusion does not lessen Staff's identification of the cumulative impact (see Figure 32 on following page); rather Staff proposes that such effect be considered outside the scope of a site-specific proposal.

COMMITTEE FINDINGS AND CONCLUSIONS

A careful review of the record, including examination of the Final Joint Environmental Statement, establishes that housing is available in the County of Sonoma to accomodate the labor force expected to be drawn to the area by the proposed project. The evidence submitted by the County, while persuasive in showing that the housing market is shrinking and is sufficient to support its proposed Finding #2, but does not support a finding of "no availability" as proposed in the County's Finding #1.

The Committee is concerned with the need to distinguish the statewide housing situation from the county-specific conditions of Sonoma when assessing the diminishing availability of housing to workers. The path proposed by the FJES--reflecting local, state and federal input--is considered effective by the Committee: to assess and prepare mitigation of the cumulative impact on Sonoma County housing from a regional geothermal development perspective. As the Committee is aware of the Commission's current steps to create a Geysers Area Cumulative Impact Committee,* it is recommended that such body take into consideration the area of housing for detailed examination and mitigation. As a result, the County's proposed Finding #3 is not accepted.

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* An Order Instituting Hearings was presented by Comm. February 11, 1981 Business Meeting. Although the OIH the Commission announced its intention to establish cumulative environmental impacts in the KGRA and mitigation measures.

2. Fiscal Effects

"Applicant's Statement Re Socioeconomic Impacts in Sonoma County" (Appendix C) proposes to mitigate certain impacts by direct negotiation with Sonoma County (the condition of roads, expenses for emergency medical treatment, and cumulative impacts). Because these measures were developed between the Applicant and Sonoma County, the Commission staff deferred to the County's position to assess reasonableness and feasibility. (RT 702 and 709)*

(a) The Healdsburg-Geysers Road (14 miles long, running from Highway 128 up to Geysers Resort Road) will be used by SMUD for construction traffic. J.D. Morelli, Sonoma County Assistant Director of Public Works, estimates that salvage and restoration cost/mile during a 10-year period will be $500,000.00 annually, and maintenance/mile will be $15,000.00 annually.

Applicant has already volunteered to participate in necessary assessment proceedings by filing a conclusion that states:

> The Applicant shall be subject to special assessment proceedings in Sonoma and Lake Counties should either county determine that such proceedings are necessary to ensure adequate improvement or maintenance of roads impacted by the construction of this facility.

Applicant's attorney emphasized that the above conclusion commits the Applicant to participate in assessment proceedings. (RT 791-792) This conclusion is supplemented with mitigation measures proposed in paragraph 1.2 of Applicant's Statement:

> "If an assessment district is created to insure adequate improvement or maintenance of roads impacted by the construction of SMUDGEO #1,

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* On February 3, 1981, Staff and Applicant consolidated their jointly-sponsored findings and a conclusion in the area of Fiscal Effects (Appendix A). Because of the disputed nature bewteen the Applicant and County regarding certain mitigation measures, the Committee's Findings and Conclusions should be read carefully for an explanation of the approved findings, conclusions and conditions.

> SMUD shall be subject to special assessment proceedings in Sonoma County initiated by that district, provided that SMUD may offset the payment made pursuant to paragraph 1.1 against any amount assessed for operation and maintenance of the Healdsburg-Geysers Road during construction of SMUDGEO #1.* If some other method of financing the road's improvement is created (for example, voluntary agreement between road users) SMUD agrees to pay its share, proportionate to its use, of the improvement and maintenance of the Healdsburg-Geysers Road."

Applicant's attorney insisted that reading this paragraph with the conclusion in "Fiscal Effects" firmly establishes SMUD's participation in prospective assessment proceedings. (RT 791) SMUD restated its position in its February 13, 1981, "Closing Statement":

> By agreeing to paragraph 1.2, SMUD makes it quite clear that it is prepared to pay its fair share, proportionate to its use, of the repair and maintenance of the Healdsburg-Geysers Road. (P.2)

Sonoma County seeks a condition to the AFC that will waive SMUD's recourse to the Majority Protest procedures available to veto proposed assessments.** (RT 794) Staff proposed that such a procedure be developed as a condition precedent to veto, to avoid requiring SMUD to forfeit a statutory right as a condition to certification. (RT 794)

SMUD protests further conditions on the ground that such conditions may be forfeitures (RT 797) and may be an extra-jurisdictional reservation of Commission authority to impose additional terms on an AFC in the post-certification process (see Applicant's "Closing Statement"). SMUD also cites Streets and Highways (S&H Code Section 10311) as adequate protection of the county assessment plans:

> If the protest is against the proposed improvement and the legislative body finds the protest is made by owners of more

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* Paragraph 1.1 promises payment to Sonoma County of $75,889--the estimated 1-year cost (over 10-year program), based on use, for road restoration--within 60 days of certification.

** S&H Code Sections 2930, et. seq.

than one-half of the area of the land to be assessed for the improvements, and protests are not withdrawn so as to reduce the protests to less than a majority, no further proceedings shall be taken for a period of one year from the decision of the legislative body on the hearing, unless the protests are overruled by an affirmative vote of four-fifths of the members of the legislative body. Any person making a protest may withdraw the protest, in writing, at any time prior to the conclusion of the protest hearing. The legislative body may confirm, modify or correct the proposed assessment.

Sonoma County replied by stating that Section 2930 of the Streets and Highway Code (Majority Protest Act) authorizes a unilateral and irreversible abandonment of a proposed assessment, notwithstanding the four-fifths override provision in The Municipal Improvement Act of 1913:

"Notwithstanding anything in this division or in any law to which proceedings under this division are applicable, if at any time before the adoption of an ordinance or resolution of intention or within the time when protests may be filed under the provisions of any such law there is a written protest filed with the clerk of the legislative body by the owners (as defined in the act under which it is proposed to proceed) of a majority of the frontage of the property fronting on the ...improvement in those cases where the cost in whole or part of the...improvement is to be assessed upon the property fronting on the...improvement, or by the owners of more than one-half of the area of the property to be assessed for the...improvement is to be assessed upon the property within a district, and protests are not withdrawn so as to reduce the same to less than a majority, then the proposed proceedings shall be forthwith abandoned, and the legislative body shall not for one year from the filing of that written protest commence or carry on any proceedings for the same improvement or acquisition. Any such protest may be withdrawn by the owner making the same, in writing, at any time prior to the conclusion of the protest hearing held pursuant to the law under which it is proposed to proceed or any adjournment thereof." (emphasis added)

In pointing to S&H Code Section 2930, Sonoma County Counsel cited County of Riverside v. Whitlock, 22 Cal.App.3d 863, 99 Cal.Rptr. 710, which said "Under the Majority Protest Act, upon protests by owners of the majority of the land area proposed to be assessed, the proceedings must be abandoned." (870).

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* Streets and Highways Code Section 10000 et. seq.

The Court added a footnote to this statement, however, which provides: Where proceedings are conducted by a chartered city or county or chartered city and county, a majority protest may be overruled by four-fifths vote of the legislative body without regard to the nature of the improvement. (Art. XIII, sect. 17, Cal. Const.)*

Article 16, Section 19 of the State Constitution provides:

> "All proceedings undertaken by...any county...for the construction of any public improvement...where the cost is to be paid in whole or in part by special assessment...shall be undertaken only in accordance with the provisions of law governing: (e) postponement or abandonment, or both, of such proceedings in whole or in part upon majority protest, and particularly in accordance with such provision as contained in Sections 10, 11 and 13a of the Special Assessment Investigation, Limitation and Majority Protest Act of 1931 or any amendments, codification, reenactment or restatement thereof.
>
> "Notwithstanding any provisions for debt limitation or majority protest as in this section provided, if, after the giving of such reasonable notice by publication and posting and the holding of such public hearing as the legislative body of any such chartered county, ..., such legislative body by no less than a four-fifths vote of all members thereof, finds and determines that the public convenience and necessity require such improvements or acquisition, such debt limitation and majority protest provisions shall not apply. (Emphasis added)
>
> "***."

At the March 18, 1981 Committee Conference Sonoma County Counsel pointed out that Sonoma County is not a chartered county.

Staff questioned the authority of the Commission to require waiver of a legal right as a condition to certification but suggested that the Applicant could be asked to return to the Commission for a hearing on the reasonableness of a proposed assessment before exercising the potential power of majority protest.

Applicant opposed any procedure whereby a binding determination on the reasonableness of a proposed assessment would result from a Commission hearing explaining:

> "In essence, we feel we're being asked to sign a blank check right now to agree to whatever they decide is reasonable and the Commission concurs, but maybe SMUD doesn't think and we're not prepared at this point to waive whatever legal rights or remedies we may have at that time on that issue." (RT 797)

COMMITTEE FINDINGS AND CONCLUSIONS

Paragraphs 1.1, 1.3, and 2 of the Applicant's Statement (Appendix C) are accepted by the Committee as reasonable and feasible measures to partially mitigate the impacts on the Healdsburg-Geysers Road and fully mitigate the potential impact on insurance liability, and emergency medical services due to accidents and injuries at the proposed project. This finding is based on the County's acceptance of these proposals and the Staff's concurrence with the County's determination that such measures will adequately avoid significant socioeconomic impacts.

The dispute between the Applicant and County regarding paragraph 1.2 (Appendix C) is apparently based on each party seeking clarification of its prospective legal rights and duties during assessment proceedings that may (and probably will) be necessary for the maintenance and improvement of the Healdsburg-Geysers Road as geothermal development activity increases. Applicant has consistently and unequivocally agreed to pay a fair share of any future costs; Sonoma County has requested that a mechanism be developed to bind SMUD to assessment proceedings. It is also clear that Applicant refuses to waive potential legal rights and is concerned that its tax exempt status not be handled adversely when assessment proceedings begin.

To create an adjudicatory mechanism ensuring SMUD's participation in prospective assessment proceedings and protecting Applicant from excessive taxation for maintenance and improvement expenses related to Healdsburg-Geysers Road, the Committee considered the following possibility:

1. SMUD shall participate in assessment proceedings initiated to maintain, salvage and restore the Healdsburg-Geysers Road.

2. If SMUD disagrees with the assessment allocation proposed by Sonoma County, it may appeal to the Commission.

3. The Commission will evaluate the assessment allocation by allowing SMUD an offset for amounts paid under Paragraph 1 in the February 13, 1981, "Applicant's Statement re: Socioeconomic Impacts in Sonoma County".

The Committee does not recommend this approach for two reasons. First, it may be procedurally awkward for all interested parties to participate in a Commission hearing for SMUD while the County pursues implementation of an assessment district with other utilities. Second, even if this awkwardness is overcome, it appears unclear how Commission determinations on SMUD's financial liability could be coordinated with nonparticipating third-party utilities.

Instead, the Committee recommends approval of the procedure proposed by Applicant (paragraph 1.2, Appendix C). The Applicant will participate in a special assessment proceeding, provided that offset for previous payments is allowed; if a different process is used, Applicant agrees to pay a fair share.

By approving this approach, and thereby establishing it (paragraph 1.2, Appendix) as a condition to certification, the Committee believes that the roads affected by project development and operation will be adequately maintained.

The Committee will not predetermine what is a "fair amount" to assess SMUD for the maintenance and improvement of the Healdsburg-Geysers Road. In the AFC proceeding both parties were provided an opportunity to define this issue through private negotiation; the failure of those negotiations (and absence of Commission staff from those discussions during the last 11 months), is not a proper basis for the Committee to develop a new agreement.

(b) The mitigation measures proposed by Applicant in paragraph 3 of its February 3, 1981, filing reads:

> "SMUD agrees to participate in any proceeding conducted by the California Energy Commission or the Geothermal Resource Information Planning Services Commission* to evaluate cumulative socioeconomic impacts at The Geysers and further agrees to participate in joint action to mitigate its share of significant cumulative socioeconomic impacts on a voluntary basis with other geothermal developers, provided that such other developers are not given a credit for local property taxes paid by them against any amount contributed to such a joint action program."

Sonoma County emphasized that the process of identifying and mitigating cumulative impacts after certification should be a condition to the AFC. (RT 800) Staff expressed concern about the language of the last phrase, beginning "provided that such...". Applicant clarified that this clause did not condition its agreement to participate in cumulative socioeconomic proceedings (RT 701), only the determination of its payment in joint action programs.

COMMITTEE FINDINGS AND CONCLUSIONS

Paragraph 3 of the Applicant's Statement (Appendix C) is to be read in separate parts, indicating, first, that it represents an unequivocal

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* Underlining added by Applicant at February 5, 1981, hearing. (RT 700).

agreement from the Applicant to "participate in any proceeding conducted by the California Energy Commission or GRIPS to evaluate cumulative socioeconomic impacts at the Geysers" and, second, a proposal to participate with other regional developers in mitigating cumulative socioeconomic impacts provided that contributions to such joint action are apportioned without discriminating against the Applicant because of its tax exempt status.

The Committee accepts and approves the Applicant's agreement to participate in cumulative socioeconomic impact proceedings and concludes that this is necessary to begin an assessment of those impacts and corresponding mitigation measures suggested in the FJES.

The Committee does not require or disapprove the second proposal--participation in a "joint program". The Committee is withholding action because the joint program is prospective in nature (planning to mitigate potential but unspecified cumulative socioeconomic impacts) and possibly inequitable because of the absence of participation in its planning by other potential parties. However, the Applicant is encouraged to engage the participation of other regional developers to begin "joint programs" consistent with the terms of this Decision.

9. CULTURAL RESOURCES

The AFC (pages 5-105 and 106) reports that Aminoil (the leaseholder) obtained the services of Dr. David A. Fredrickson, Professor of Anthropology at Sonoma State University, to prepare a study on cultural resources in the area of the proposed plant in November 1979 (included as Appendix E of the AFC).* The study examined four cultural resource components: paleontological, prehistoric, historic and contemporary Native American.

Although no prehistoric or historic archaeological sites were identified within the leasehold, Applicant will contact a qualified archaeologist to evaluate finds unearthed during construction and recommend mitigation measures developed in consultation with local Native Americans.

Consultants who are descendants of and knowledgeable about the cultural traditions of the Wappo, Southern Pomo, and Lake Miwok Tribes participated in the cultural resources investigation. The leasehold is located almost entirely on the historical territory of the Wappo Tribe (See "Map 3" of the Fredrickson Study on following page), which was probably used for hunting, temporary camping and gathering, and visits to medicinal hot springs. The springs along Big Sulphur Creek (which became known as the "Little Geysers" in the late-19th century) were particularly important to the Wappo, who like other Native Americans in the region held The Geysers geothermal area to be sacred. Flanking the leasehold on the east and west are important aboriginal trails that served The Geysers region. The Mayacmas Ridge trail passes an important Lake Miwok site (CA-LAK-711), about 1,000 feet northeast of the plant site. The Sulphur Creek trail winds to the Russian River near Cloverdale in Southern Pomo territory.

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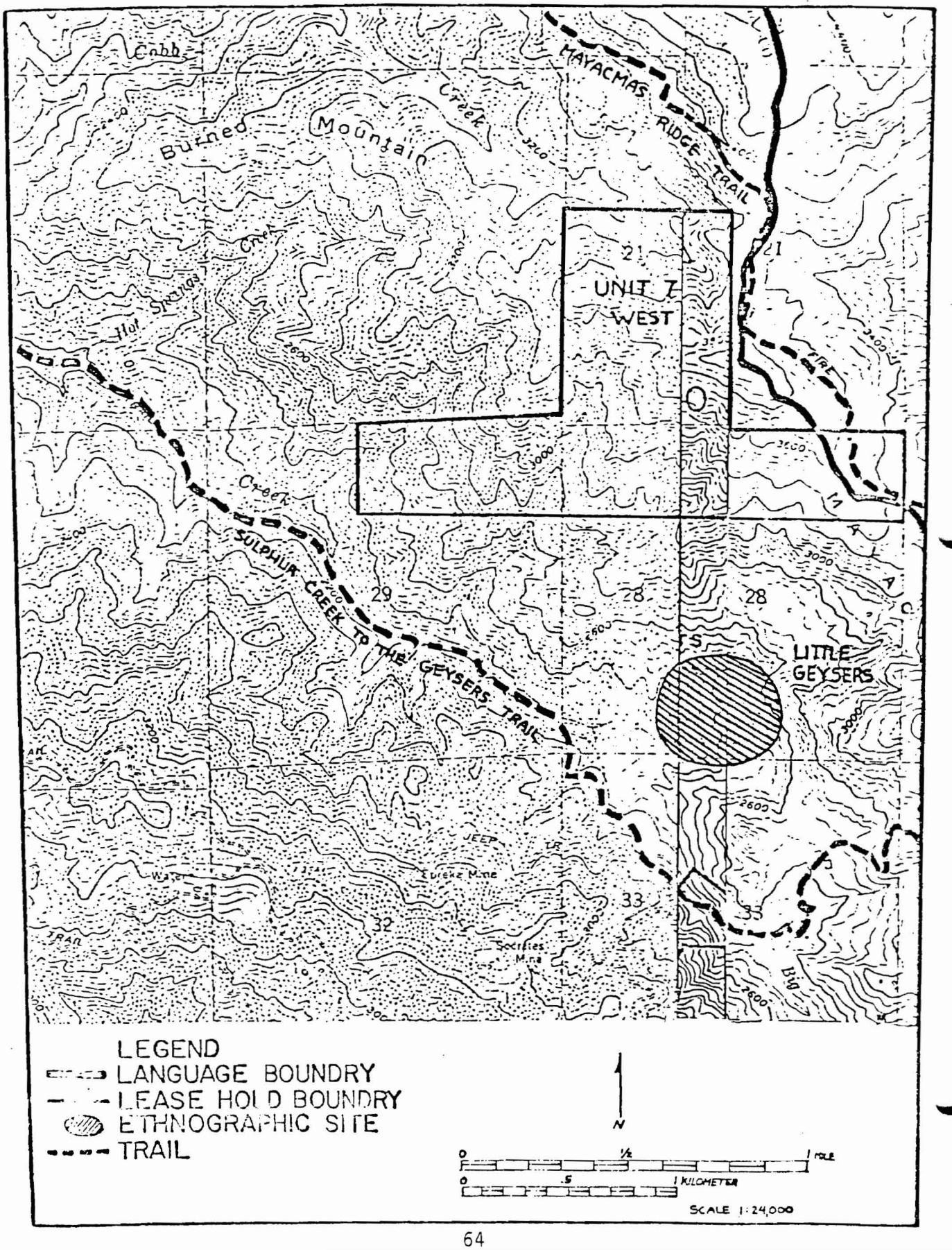
* David A. Fredrickson, "Cultural Resoruces Survey of the Aminoil 7 West Geothermal Leasehold, Sonoma and Lake Counties, California," November 1979.

MAP 3
ETHNOGRAPHIC SETTING OF AMIN OIL UNIT 7 WEST



Non-native settlement in the area began with Mexicans in the early-nineteenth century, primarily for livestock grazing. Near the proposed site two unsuccessful homesteads were attempted, the last ending in 1947. Since the late-nineteenth century local residents have visited the "Little Geysers" area to bathe in the numerous fumeroles.

The FJES concludes that construction and operation of the power plant and steam field will not directly impact the Little Geysers area. Currently, nomination of the Little Geysers site to the National Register of Historic Places is being examined. Until historical status is obtained, Staff recommends creating a buffer zone in consultation with Native Americans and ethnographers. However, the FJES concludes that the project will have no impact on legally recognized hisotrical resources and thus, no mitigation measures are required.

COMMITTEE FINDINGS AND CONCLUSIONS

The uncontested evidence establishes that there are no known resources of cultural or historical importance to be significantly affected by this project. The certainty of this finding reflects Staff and Applicant presentations, including the on-site examinations conducted with the participation of local Native American consultants.

The Committee invites the Applicant to voluntarily create a buffer zone as suggested in the FJES to protect the Little Geysers area, but does not order it so long as the Applicant is careful to avoid degradation of the Little Geysers area.

Finally, the Committee concludes that the project can be developed without significant impact to the cultural and historical resources of the area.

10. ENVIRONMENT

a. SOILS

R.P. Kitchell, Project Manager for Stone & Webster Engineering Corporation, prepared the Applicant's AFC section on soils.* He identified erosion and sedimentation as the most significant environmental impacts from plant development, but stated that both could be mitigated by specific revegetation procedures. Those procedures are contained in the "Wildlife Mitigation Plan" (discussed in section 10b) which integrates mitigation efforts that include soil impacts.

The FJES evaluated proposed mitigation steps as they relate to soils and concluded that all significant impacts can be avoided:

> "Disturbance of topographic features, soils and vegetation resulting from construction of power plant facilities, well pads, access roads and transmission lines could cause significant erosion problems. These impacts can be successfully mitigated by appropriate slope design and preparation during development of the proposed site and steam supply field. Adequate drainage facilities will be provided under the fill areas and on the slopes to mitigate potential erosion; exposed soil surfaces will be revegetated and adequately protected prior to seasonal rains." (FJES, p. v).

Marco Farro evaluated the Applicant's AFC submission on soils and participated in the preparation of the soils section in the FJES. Lloyd Dillon, Facility Site Planner, filed testimony that the soil erosion rate at the proposed site will be greater than the Applicant expects (because the Applicant used the Universal Soil Loss Equation Study of agricultural lands); he predicts impact will be limited to the interim period between initiation of construction and the implementation of an erosion control program. Mitigation will focus on a limit to the steepness and height of cut and fill slopes, stockpiling of the topsoil for better revegetation after the construction phase, hydromulching to enhance rapid revegetation, diversion ditches, ditch sedimentation collection systems (to protect Cobb Creek and Calm Creek), and observance of a winter rainy season construction moratorium.

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* Application for Certification, Section 5.6, pages 5-45 through 5-47.

Applicant and Staff jointly sponsored the findings contained in the Soils section of Appendix A, from which they concluded that this project can be constructed without significant adverse environmental impacts and in compliance with applicable laws, regulations and ordinances. To ensure that these objectives are reached the Applicant agreed to the following conditions:

1. Implement the mitigation measures described in Findings 1-4, 7 and 9, to prevent sedimentation and accelerated erosion.
2. Annually quantify the amount of sediment removed from the sedimentation collection and containment system and provide this information before October to the CEC staff* and the USGS. The USGS in consultation with the CEC may require alternative mitigation measures if those proposed are inadequate. This condition will be reviewed by the USGS and CEC after three years of plant operation to determine the need for its continuation.

No additional evidence was introduced at the Evidentiary Hearing to dispute the findings, conclusion and conditions jointly-sponsored by the Applicant and Staff.

COMMITTEE FINDINGS AND CONCLUSIONS

On the basis of the unrebutted evidence presented to the Committee it is found that all significant soil impacts (erosion and sedimentation) have been identified in accordance with Title 20, California Administrative Code Sections 1741 and 1742. Given the discussions in the AFC, FJES, docketed data inquiries and responses, and testimony at the evidentiary hearing, it is

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* At the February 5, 1981, Evidentiary Hearing Staff explained that it has accepted responsibility for consulting with the North Coast Regional Water Quality Control Board in order to maintain current information as described in the FJES, page 18.

concluded that the jointly sponsored conditions specified in the Soils section of Appendix A will avoid significant adverse environmental impacts. Included in the Committee's evaluation of the parties' presentation in this subject area is the "Wildlife Mitigation Plan" discussed in section c.

b. WATER QUALITY AND RESOURCES

R.P. Kitchell authored the Applicant's AFC submittals on water (including data responses) and testified that the jointly sponsored findings, conclusions and conditions will avoid significant adverse environmental impacts.* His filed testimony locates the plant site at the apex of a northwest-southwest trending ridge between the Big Sulphur Creek and Cobb Creek drainages.** As the site will be created by leveling the top of a ridge, it is anticipated that the only runoff will be from precipitation and off-site drainage flooding will not occur. Precipitation is seasonal (80 percent during the months from November through March) and predominantly from general storms of several days' duration. Runoff will be collected by a roof and yard drainage system routed to a site catch basin. From this basin water will be pumped to the cooling tower basin for reinjection or use as cooling water. Overflow will be routed to the sedimentation check dam system. Runoff systems are designed on a 100-year storm base.

Kitchell reviewed literature developed by other companies in The Geysers Area (Pacific Gas and Electric, Union Oil, Aminoil) and several resource agencies and county planning departments. In 1975, the Department of Fish and Game began monitoring the Big Sulphur drainage system to measure and evaluate the extent of natural geothermal emissions impact on water quality.

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* See AFC section 5.4.

** 381 of the 396 acre leasehold are in Sonoma County's Big Sulphur Creek drainage, a tributary to the Russian River. See FJES, pp. 37-48. According to L. Dillon, the Big Sulphur Creek watershed is 581 square miles in size.

In October 1979, Applicant initiated a quarterly field monitoring program to collect background information on the chemical quality of surface waters near the proposed site and Aminoil leasehold. Sampling stations on Big Sulphur, Cobb, Calm, Hot Springs and Little Geysers Creeks were established as illustrated in figure 5.4-2 on the following page.*

The entire site will be surrounded by a half-foot berm and drained to catch basins. Leaks from plant spills and equipment or floor drain discharge will be collected, treated, and with containment area runoff be pumped to the cooling tower basins. The Final Joint Environmental Statement concludes that the berm containment will avoid significant degradation of water quality. It also notes that while contamination of surface areas could occur as spills during transportation of toxic or harmful substances (related to the H_2S abatement systems), such dangers have a low probability and can be mitigated with improved safety precautions and training.

Lloyd Dillon testified for Staff in support of the project and explained that he participated in the Commission staff's FJES on Water Supply, Quality, Resources and Hydrology. After reviewing the Applicant's AFC filings and data responses, it is his professional opinion that no significant adverse impacts on water quality and resources will occur from this proposal that are not reasonably mitigated by the jointly-sponsored conditions.

SMUD and Staff have jointly sponsored findings, conclusions and conditions to the Committee which their witnesses have testified are adequate to prevent

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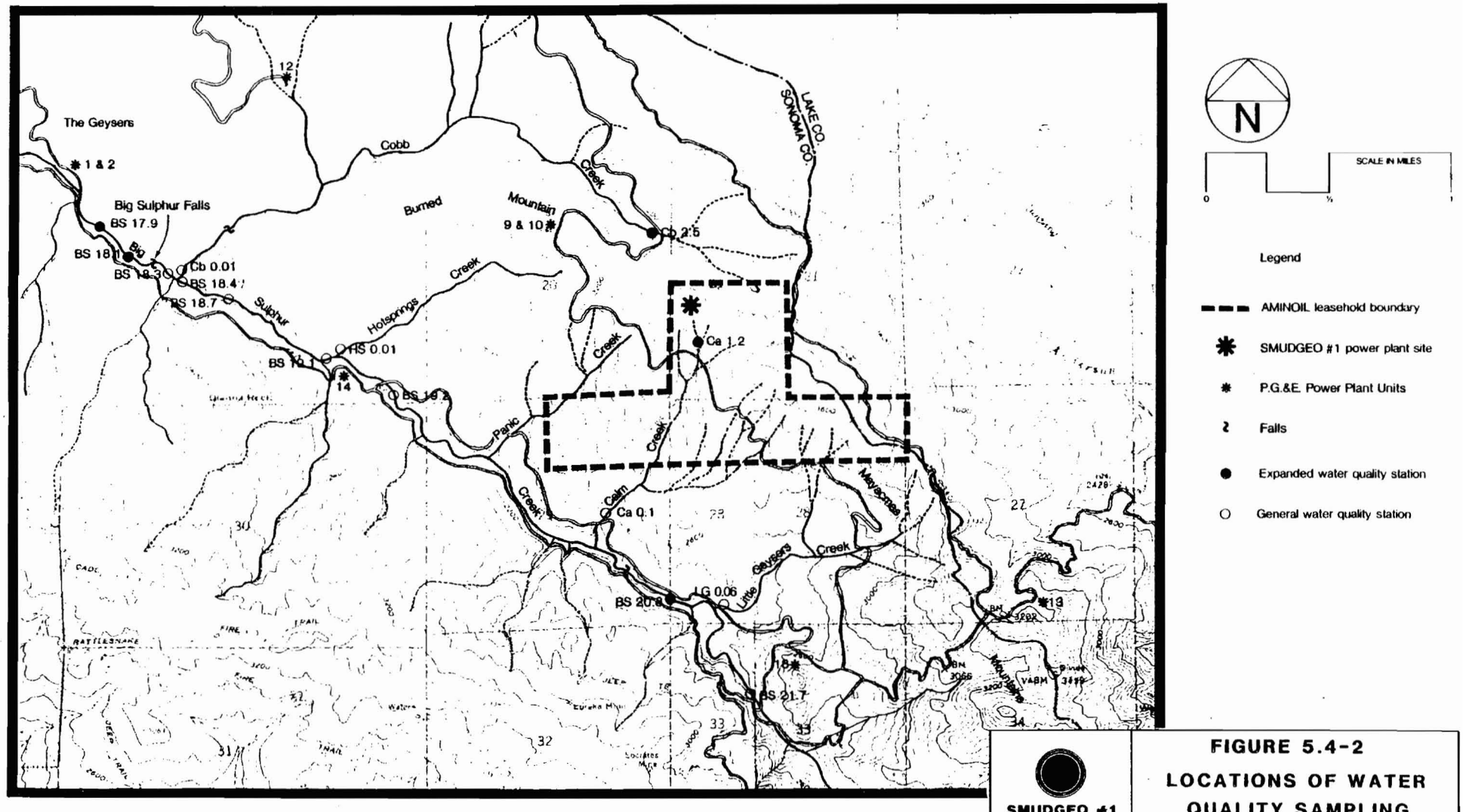
* To maintain consistency with the work of R.S. LeGore, the diagram of sampling stations preserves the river mileage error for Big Sulphur Creek (the actual distance to the bridge leading to PG&E Units 1 and 2 is 14.8 river miles rather than 17.7; correction may be calculated by reducing river mileage between Big Sulphur Creek sampling stations by 2.9 river miles. see: LeGore, R.S. 1975. "The effects of geothermal energy utilization on steam biota and water quality at The Geysers, California." Final Report. Parametrix, Inc., Environmental Services Section. Seattle, Washington. Submitted to Union Oil Col. 290 pages.



SMUDGEO #1
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FIGURE 5.4-2
LOCATIONS OF WATER QUALITY SAMPLING STATIONS

significant adverse environmental impacts (see Appendix A, "Water Quality" and "Hydrology and Water Resources").

COMMITTEE FINDINGS AND CONCLUSIONS

Based on the documentary and oral evidence presented to the Committee it is found that all significant water quality/resource impacts (drainage and supply) have been identified in accordance with Title 20, CAC Sections 1741 and 1742. The Committee also adopts the jointly-sponsored findings, conclusions and conditions proposed by SMUD and Commission staff (Appendix A, "Water Quality" and "Hydrology and Water Resources") and concludes that their implementation will avoid significant adverse environmental impacts.

It is noted that Findings 5 and 6 in the "Water Resources" section identify a developing impact generic to The Geysers area. In this particular case the expectation that 11 acre-feet of water (Water Resources Finding 11) for construction during a 2½ year period will be needed is mitigated by a requirement (Condition 3) that usage be reported monthly to responsible agencies during the construction period. To account for the potential cumulative impact that may be developing, the Committee recommends that the subject area of water resources be submitted by Staff to the Commission in its Geysers-Calistoga Cumulative Impacts Hearings expected to begin in Summer 1981.

c. BIOLOGICAL RESOURCES

James R. Eckert, an Ecologist with Stone & Webster, assisted in the preparation of SMUD's AFC section dealing with Biological Resources (AFC Section 5.7). His filed testimony reports that in October and November 1979 a general biological reconnaissance was conducted and selected quantitative studies were done on small mammals, songbirds, fish and vegetation. The study included a literature search.

During construction, the following biological impacts are expected to occur: 1) Vegetation--permanent loss of mixed chaparral on the 6.9 acre plant site, the 1.8 acre adjacent fill area, and along the access road including its associated fill; damage to root systems from heavy traffic, affecting vegetation which currently helps absorb winter rainfall leading to increased surface runoff and erosion; deterioration of surrounding vegetation from paved road and plant site runoff with defoliation from road tars spray mist; 2) Wildlife--displacement of creatures currently occupying the plant site and related facilities but no extermination of any species; improvement of habitat for black-tailed hare, western fence lizard, mourning dove, California quail and possible improvement for western harvest mouse and California meadow mouse; 3) Aquatic Resources--alteration of habitat due to stream sedimentation from soil disturbance but limited impact on trout populations due to their distance from the plant site (see AFC page 5-63 and 5-79); 3) Threatened, Rare, Endangered and Special Concern Species--minor loss of potential foraging habitat for the Peregrine Falcon (sporadically present in the KGRA and capable of foraging over large areas), the Golden Eagle (whose ability to forage over large areas reduces the significance of on-site habitat loss), and the Ringtail (whose presence in the leasehold has not been substantiated); insignificant loss of foraging habitat for the Cooper's Hawk, Sharp-shinned Hawk, Prairie Falcon, Purple Martin, Mountain Lion, and Rainbow/Steelhead Trout; and 4) Areas of Critical Concern (ACC)--although none are located on the site, three nearby ACC (Cobb Creek, Calm Creek and Calm Creek Spring) could be adversely affected. Precautions will be taken to avoid silt washing from the site to the Cobb Creek ACC, 235 m (775 ft) downslope via established drainage; construction of a retaining wall to stop siltation to the Calm Creek ACC; temporary siltation of the Calm Creek Spring due to the access road coming within a few hundred meters of the ACC.

During operation, the following biological impacts are expected to occur: 1) Vegetation--stress due to cooling tower drift containing Boron exhibiting leaf necrosis (tissue death) and chlorosis (yellowing of green plants), needle tip burn and banding (constriction) of conifers; emergence of old, decadent chaparral because of fire prevention measures; 2) Wildlife--Noise from cooling towers, steam venting and vehicular traffic has not been shown to significantly affect wildlife* but this conclusion may reflect the particular variations to investigating specie impact (wind speed and direction, time of day or season, duration of noise and ambient noise levels); 3) Aquatic Resources--accidental spills may cause significant impact upon aquatic organisms; 4) Threatened, Rare Endangered and Special Concern Species--same as during construction; and 5) ACC--greatest potential for adverse impact is from cooling tower drift damage to vegetation habitat. The Cobb Creek ACC is downslope and often downwind of the plant site rendering it the most vulnerable of the three ACCs.

Mitigation measures for the construction and operation phases were developed through workshops during the AFC proceeding, resulting in the "Mitigation and Monitoring Plan" prepared as Appendix A to the jointly-sponsored findings, conclusions and conditions in the area of Biological Resources. When read with the workshop Summary Notes prepared on September 30, 1980, the measures constitute a program for the prevention of significant environmental impacts.

The FJES documents a site visit on June 16-18, 1980, during which the Applicant conducted surveys. Mitigation measures to avoid significant environmental impacts on biological resources were discussed as follows: 1) Vegetation--

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* See: AFC, page 5-82.

no rare or endangered plant species are on the leasehold. SMUD's cooling tower will operate with a draft elimination specification (see Section 2, Air Quality) of .001 percent of the 125,000 gallon per minute circulating water mass, a lower rate than existing geothermal units. Those impacts identified in the AFC can be mitigated by implementing the revegetation program and restricting vehicle access pursuant to the "Wildlife Mitigation Plan"; 2) Wildlife--although legally protected species may be present in or near the plant site, no mitigation measures are deemed necessary: the American peregrine falcon's closest eyrie is 10 miles northwest, the golden eagle has been sighted in the vicinity of Cobb Mountain but no active nests have been found in the Geysers-Calistoga KGRA, and the foraging activities of the ringtail will be displaced by the limited intrusion for the plant site and related facilities (less than 10 acres). A recreationally valuable species, the black-tailed deer will be reduced in population (it is estimated that this species has a population density in the area as high as 0.4 to 0.7 per acre). Several species of special concern may be in the KGRA, of which only the purple martin has been observed breeding. Disturbance by human activity may decrease these species' use of the area but such impact is not considered significant; 3) Areas of Critical Concern--although no ACCs are located on the leasehold, impacts on nearby ACCs has been studied. Birdsong Meadow is particularly critical because it was designated in Pacific Gas and Electric's Geysers Unit 18 project to compensate for the degradation of Oatgrass Meadow.

The FJES recommends approval of the Applicant's proposal, provided that SMUD fulfills the measures specified in its AFC (pages 5-85 through 5-89) and the September 3, 1980, "Mitigation and Monitoring Plan" and also implements the shrub planting and snag work (FJES, page 34) proposed by the Department of Fish and Game. The study of this project by the FJES reflects

CEC staff consultation with the California Department of Fish and Game, United States Fish and Wildlife Service, Bureau of Land Management, and United States Geological Survey.

COMMITTEE FINDINGS AND CONCLUSIONS

Based on the evidence submitted by Applicant and Staff, the Committee accepts as its own the proposed findings in the area of Biological Resources and determines that the material presented adequately identifies the expected environmental impacts in accordance with Title 20, CAC Sections 1741 and 1742. The Committee also concludes, after consideration of the FJES in addition to the evidentiary presentation of Staff and Applicant, that the proposed project can be built without significant, adverse environmental impacts. This conclusion is based on the Committee's acceptance of the Applicant's committment to fulfilling the conditions specified in the Biological Resources Section of Appendix A as well as any separate conditions identified in the "Mitigation and Monitoring Plan" and the Application for Certification, Section 5.7.

11. NEED AND FINANCING

a. NEED

Section II, Appendix C, California Administrative Code, requires an applicant to present evidence that the proposed project conforms to "the level of statewide and service area electrical demand adopted by the commission pursuant to Section 25309 of the Public Resources Code." Part D permits the applicant to demonstrate need by reference to the most recent Biennial Report.

Although SMUD filed its AFC before publication of the 1981 Biennial Report, its submittal is still responsive because the demand forecast of geothermal power assessed at page 50 of the 1979 Biennial Report has been exactly preserved at page 374 of the 1981 edition:

> "We will continue to certify the maximum number of geothermal sites and facilities that demonstrate reasonably mitigable environmental impacts and that meet existing air and water quality standards. Any facility that meets these criteria will be deemed needed."

The Commission explained its continued preferential treatment in the latest report, at page 374:

> "Although the full available potential for geothermal, renewable energy resources, interutility connections, and cogeneration could exceed the 1992 need for new electricity supplies specified by the Commission, it is extremely unlikely that enough projects can be developed and proposed within the next two-year regulatory period to realize this potential."

Accordingly, the focus of this proposed Final Decision has been on identifying potential environmental impacts and reasonable mitigation measures to ensure that this project can go forward without causing significant adverse effects.

b. FINANCING

Part III, Appendix C, California Administrative Code, identifies fiscal factors to be addressed by an Applicant:

- Financial requirements for construction and operation, with a table summarizing capital requirements and operating expenses. Bases for assumed escalation rates and costs of capital, fuel or other principal components must be included.

- A summary of the cost of the installed generating capacity ($/kw) and the cost of supplying energy at the busbar (¢/kwh).
- An explanation of cost allocation when multiple plant transmission line facilities are used.
- A discussion of the estimated impact of the proposed facilities on customer rates during construction and operation.
- Any other information necessary to secure a certificate of public convenience and necessity from the Public Utilities Commission.

Lee R. Keilman, SMUD Supervising Mechanical Engineer, prepared section 3.0 ("Financial Impacts") of the Applicant's AFC and testified at the Evidentiary Hearing. Total 1983 on-line cost of the project (steam supply, capital recovery, operation and maintenance, renewable and replacement, and power interchange) will be 46 mills/kWhr. Using a 1978 base, SMUD estimates that the $54 million capital cost of SMUDGEO #1 will add to its $817 million plants in service capital cost by 7 percent, and provide 385,000,000 KWhr (5 percent) to its total annual energy mix (hydro, and nuclear generation, and purchased power constituting the total). SMUD predicts that this project will have a small impact on its electrical rate structure, and then only to the degree by which future time of day and seasonal rate differentials are based on marginal costs.

Ezra Amir, Senior Program Specialist at the Commission, introduced an analysis of this project's financial impacts which he prepared for the Final Joint Environmental Statement. He pointed out in his filed testimony that the Applicant and Staff varied in their cost estimates but that the expected cost for the life of the plant is 7.7 - 8.0¢ per KWh of energy generation (using both parties' figures respectively). Amir stated that the generated cost of geothermal electricity will be less than the 9.6¢ per KWh levelized cost for new coal plant generation during the same time period from 1983 through 2010, but more than the 6.6¢ per KWh SMUD systemwide cost of generating electicity.

COMMITTEE FINDINGS AND CONCLUSIONS

Based on the Commission's designation of geothermal steam as a preferred resource and the previous determinations in this Decision that the Applicant's project can be constructed and operated without significant environmental impacts, the Committee finds that the SMUDGEO #1 geothermal power plant is needed in accordance with Section 25309 of the Public Resources Code. It is also found that the proposal will add about 7 percent to Applicant's in service capital cost and have only a small impact on its electrical rate structure.

APPENDIX A

APPLICANT-STAFF FINDINGS, CONCLUSIONS AND CONDITIONS

1. TRANSMISSION LINES

a. TRANSMISSION LINE ENGINEERING

Conclusions

1. The proposed transmission facilities are consistent with standard engineering practices.

2. Alternative C is the preferred route for the transmission line because it is more economical and will result in less line losses.

Conditions

1. The Applicant shall use its proposed methods in constructing the proposed transmission facilities.

2. The Applicant shall use Alternative C as the route for the transmission tap line.

b. TRANSMISSION LINE SAFETY AND NUISANCE

Conclusion

1. If the Applicant meets the conditions below, the proposed transmission line will comply with applicable laws, standards and criteria and will not pose a significant safety hazard or be a significant nuisance to the public.

2. The Applicant shall comply with the laws, standards and ordinances listed on page 8-9 of the AFC. In addition, the Applicant shall comply with California Public Resources Code sections 4292 through 4296; Title 8, California Administrative Code sections 2940 et seq. and 2950 et seq.; and Subchapters 4 and 7, Title 8, California Administrative Code, and Federal Aviation and Administration Part 77.13.

3. All fences shall be grounded following the SMUD grounding criteria for fences.

4. The Applicant shall investigate complaints received regarding induced current from vehicles, large metallic roofs, fences, gutters or other such objects. If the complaints are valid, the Applicant shall correct the problem if the object is located outside the right-of-way or if the object is within the right-of-way but existed prior to right-of-way acquisition. For those objects within the right-of-way but installed after acquisition, the Applicant shall notify the owner that the object should be grounded and it will be the responsibility of the owner to do so. Prior to signing the right-of-way agreement, the Applicant shall advise the owner of potential grounding responsibilities.

5. If a Radio Interference Complaint is received, the Applicant shall locate and take all reasonable steps to correct, on a case-by-case basis, all Radio Interference caused by the SMUDGEO transmission facilities including, if necessary, the modification of receivers and/or installation of antennae.

2.AIR QUALITY/SYSTEMS ENGINEERING

Findings

Compliance with Air Quality Law

1. The SMUDGEO #1 power plant is proposed to be located in the Northern Sonoma County Air Pollution Control District (NSCAPCD). The following laws are applicable to the SMUDGEO #1 power plant:

a. Clean Air Act and implementing regulations;

b. California Health and Safety Code and implementing regulations; and

c. Northern Sonoma County Air Pollution Control District Rules:

(1) 400(a)

(2) 410(a)

(3) 420(d)

(4) 430

(5) 455(a) and (b)

(6) 220 and 230 (New Source Review)

(7) 540 (upset/breakdown)

2. SMUDGEO #1 will be required to obtain a federal PSD permit. EPA has estimated that this permit should be granted by April 1, 1981.

3. A general emissions limitation contained in NSCAPCD's Ruel 400(a) prohibits the discharge of quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the

public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause or have a natural tendency to cause injury or damage to business or property (Health and Safety Code section 41700).

4. Complaints from the Anderson Springs-Cobb area as a result of H_2S air pollution continue. However, the LCAPCD and NSCAPCD specifically regulate H_2S emissions to attain and maintain the CAAQS for H_2S. Frequency of violation of the H_2S standard in the Anderson Springs-Cobb area have been markedly reduced during the past one to two years. Compliance with the H_2S standard and DOC Conditions of the NSCAPCD are expected to ensure compliance with Rule 400(a).

5. NSCAPCD Rule 410(a) prohibits any discharges for more than 3 minutes per hour which are as dark as the No. 2 shade on the Ringelmann Chart or forty(40) percent opacity. Past experience with other geothermal plants has indicated that none of the emissions from SMUDGEO #1 (with the exception of those from the ejector vacuum pump equipment) are expected to be dark or opaque enough to violate these standards. Although the Applicant has proposed an ejector vacuum pump system not currently in use at other plants in the Geysers, it has committed to design and operating the pump system to meet Rule 410(a).

6. NSCAPCD Rule 420(d) limits SMUDGEO #1 emissions of particulate matter to whichever is the lesser of:

a. 0.2 grains per standard cubic foot of gas, or

b. 40 pounds per hour.

7. The plant's total particulate emissions, including the contribution of possible secondary H_2S condensate treatment, will be approximately 3.4 lbs/hr. This emission rate includes 0.8 lbs/hr from the main cooling towers and 2.6 lbs/hr from the Stretford cooling tower. TSP emissions during power plant outages are not expected to exceed those resulting from normal plant operation.

8. NSCAPCD Rule 430 disallows the handling, transporting, or open storage of materials to result in "unnecessary amounts" of fugitive dust. The SMUDGEO #1 plant's materials will be handled, transported, and stored in a manner to avoid unnecessary fugitive dust emissions. During construction SMUD will treat the unpaved, well-traveled roads as oftern as necessary to comply with Rule 430.

9. NSCAPCD Rule 455(a) limits sulfur compounds emitted from any geothermal operation to less than 1000 parts per million (ppm), calculated as sulfur dioxide (SO_2).

10. The SMUDGEO #1 plant is expected to comply with NSCAPCD Ruel 455(a).

11. NSCAPCD Rule 455(b) limits H_2S emissions from a geothermal power plant commencing operation after January 1, 1980, to not more than 100 grams/GMWH. H_2S emissions from all geothermal power commencing operation after January 1985 will be limited to 50 gr/GMWH. The 50 gr/GMWH emission limitation will be promulgated by the NSCAPCO after proper notice and public hearing.

12. The Applicant has agreed to operate the SMUDGEO #1 power plant at an H_2S emission rate not to exceed 31 gr/GMWH (5 lbs/hr), unless ambient monitoring, as specified in section 13(a) of the NSCAPCD Final Determination of Compliance, indicates that H_2S concentrations are below acceptable levels, in which case the H_2S emission rate will be revised to 8 lbs/hr. The location(s) for a maximum of three monitoring station(s) will be jointly determined by the Applicant and NSCAPCD; and the ambient level of H_2S triggering the 8 lbs/hr emission rate is specified in the Final Determination of Compliance.

13. Emission rates of H_2S during unit outage conditions, provided abatement systems outages are not the cause of unit trip, would be approximately equal to or less than normal plant emissions.

14. NSCAPCD New Source Review Rule 220 requires that the APCO perform an air quality analysis for power plants proposed to be constructed in the District and for which an NOI or AFC has been accepted by the Energy Commission. Under Rule 230, the APCO must deny an authority to construct for such a source if the APCO determines that emissions from the source will 1) violate any applicable emission limitation, 2) cause a significant deterioration of existing air quality, or 3) "prevent the attainment, interfere with the maintenance, or cause a violation of any state or national ambient air quality standard"; or 4) interfere with any State Implementation Plan control strategy.

Rule 230 also provides that the APCO may conditionally approve a geothermal source if it is in violation of condition (3) above, if it uses Best Available Control Technology (BACT) on the contaminant-emitting equipment for any pollutants for which there is a state or national ambient air quality standards. The ARB has set an ambient standard for H_2S.

15. It is not expected that emissions of any pollutant from SMUDGEO #1 will violate any applicable emission limitation, cause a significant deterioration of existing air quality, or interfere with any State Implementation Plan control strategy.

In addition, it is not expected that emissions of TSP, nonmethane HC or SO_2 will prevent the attainment, interfere with the maintenance, or cause a violation of any ambient air quality standards for these pollutants.

16. To determine whether the proposed project's H_2S emissions will prevent the attainment, interfere with the maintenance, or cause a violation of the state H_2S ambient air quality standard, Systems Applications Incorporated (SAI), assessed air quality impacts at nearby receptor areas based on the 8 lbs/hr (H_2S) emission rate initially proposed. This impact assessment used tracer tests and computer modeling.

17. NSCAPCD, SMUD, ARB, and CEC staff agreed that the meteorological conditions which would produce the worst-case impact from the SMUDGEO #1 power plant are limited mixing conditions.

18. A reasonable estimate of worst-case impacts from SMUDGEO #1 power plant emissions is a contribution no greater than 2.0 ppb H_2S at the sensitive receptor areas (at 8 lbs/hr emission rate). These estimates, utilizing an air dispersion model, do contain uncertainties such that in the view of Lake County Air Pollution Control District and Northern Sonoma County Air Pollution Control District, the model results may be an underestimate.

19. In order to evaluate whether the SMUDGEO #1 facility will interfere with the maintenance or prevent the attainment of the H_2S ambient standard, the SMUDGEO #1 contribution must be added to the expected ambient H_2S level when the facility comes on line in 1984. The SAI Hybrid Model projected the H_2S ambient air quality in 1984 using worst case meteorology and the expected emissions rates from units operated by PG&E, DWR, and NCPA. The projected ambient H_2S from the sources was just over 24 ppb at the sensitive receptor areas.

20. The ARB, which sets and enforces state ambient air quality standards, has determined that ambient concentrations of H_2S which equal or exceed 25 ppb constitute violations.

21. In view of the uncertainty of the accuracy precision of model predictions, the projected worst case background ambient of approximately 24 ppb H_2S is sufficiently close to a violation to indicate a likelihood that a violation will occur. When SMUDGEO #1 becomes operational in 1984, and the facility's impact is added to predicted background, it is reasonably likely that a violation will occur.

22. NSCAPCD Rule 230 allows a source such as SMUDGEO #1, which will prevent the attainment of the H_2S standard, to be permitted if it employs BACT. The ARB and the NSCAPCD have determined that Best Available Control Technology (BACT) for geothermal plant H_2S emissions is five (5) lbs per hour.

23. Based upon the uncertainties of the ambient background H_2S levels, the NSCAPCO issued a conditional Determination of Compliance which requires that SMUDGEO #1 meet the 5 lbs/hr BACT emission rate for H_2S unless ambient monitoring, during 1981-1983, indicated that H_2S concentrations are below acceptable levels, in which case the H_2S emission rate will be revised to 8 lbs/hr. The location(s) for the monitoring station(s) and the ambient level of H_2S triggering the 8 lbs/hr emission rate are specified in the Final Determination of Compliance.

24. Approximately 85% of the 1984 predicted background H_2S concentrations at the receptor areas are due to contributions from existing units. Current emissions from existing units

range from 2180 gr/GMWH (from the oldest units) to 36 gr/GMWH (from the newest units) as compared to the SMUDGEO #1 emission rate of 31 gr/GMWH (5 lbs/hr). Existing units are not expected to be in compliance with their 200 gr/GMWH requirement until 1984-1986. Early control of the existing units would be effective to ensure compliance with the state AAQS for H_2S and to allow for maximum geothermal development of the area.

Abatement Systems

25. The Applicant has proposed to use three H_2S abatement systems to control H_2S to the required levels. These systems are the Stretford process (including surface condenser), the secondary condensate treatment system and a turbine bypass system.

26. The expected H_2S abatement efficiency of the Stretford unit is 99%+ of the H_2S in the noncondensible gas flow. The partitioning efficiency of H_2S into the noncondensible gas flow in the surface condenser at PG&E Unit 15 has been 67%. Since the partitioning efficiency is reasonably likely to be on the order of 67%, a secondary condensate treatment system will be required to meet H_2S emission rates of 5 or 8 lbs/hr.

27. The Applicant has agreed to provide a secondary condensate treatment system. The Applicant is investigating three systems: 1) Hydrogen Peroxide (with or without catalyst); 2) stripping with inert gas, and 3) condensate pH control with carbon dioxide (ammonia fixation).

28. The Applicant has committed to using the hydrogen peroxide process but is investigating the inert gas stripping and ammonia fixation techniques. If the results of the testing of these alternative processes show one to be economically and technically superior to the hydrogen peroxide system, the Applicant may change its design, after obtaining approval from the NSCAPCD and the Commission.

29. The function of the proposed turbine bypass system is to allow the by-passing of steam around the turbine. This provides treatment of the steam by the H_2S abatement systems installed downstream of the turbine during scheduled and emergency shutdowns, or startup conditions.

30. The turbine bypass system is presently in the preliminary design stage. Such a system has never been used before on a geothermal power plant, although it has been used successfully on other power-generating facilities.

31. It is not expected that the use of the steam bypass system will affect normal power plant operation or partitioning of condensibles and noncondensibles within the turbine condenser.

32. Although actual abatement efficiencies for the systems identified in finding 25 are not established, it appears that the proposed abatement systems could operate to achieve H_2S emissions of no more than 5 lbs/hr.

Conclusion

1. If the Applicant implements the measures specified above and complies with the Conditions below, it is likely that:

a. The abatement systems will perform effectively; and

b. The plant will conform to all applicable air quality laws.

Conditions

I. Abatement Systems Design

A. Definitions.

1. Review. Review shall mean a 30-day period during which the control agency(s) (NSCAPCD, ARB, CEC, and USGS) shall assess and inform the Applicant of any apparent deficiencies. NSCAPCD shall notify SMUD and participating control agencies of any unacceptable items 30 days after receipt of information. The control agencies shall notify the NSCAPCD of any discrepancies they have found. If no notification is given, the Applicant shall proceed on its project schedule. If notified of an apparent deficiency, the Applicant shall inform the agency(s) of its intentions to provide additional information or modifications to correct the deficiency within 30 days. A projected schedule for this information shall also be provided.

2. Design Information. This information shall contain the equivalent level of detail as the Stretford system flow diagram (AFC Figure 4.3-15, attached) submitted by PG&E in

Geysers Unit 18 AFC or as otherwise deemed appropriate by NSCAPCD. This information shall also consist of a tabulation of associated equipment (e.g., pumps, blowers, tanks, alarms, etc.) and a list indicating numbers of components and capacities. This information may be based upon final bid specifications.

3. Sixty (60) days before release for fabrication. This shall mean 60 days before the manufacture of specific equipment hardware is ordered. If design information is not provided by this time, the Applicant shall have proceeded at its own risk.

B. Conditions.

1. The Applicant shall provide the Commission Staff (through the Compliance Audit Manager - CAM), and NSCAPCD, for their review, design information on the following:

a. Stretford system,

b. Turbine by-pass,

c. Condensate Treatment,

d. Condenser/sparger system, and

e. Solids removal system (if required).

This information will be provided when it becomes available, but no later than 60 days before manufacture of equipment is ordered.

2. If the Applicant proposes a secondary treatment system other than the hydrogen peroxide system, the Applicant shall submit information to NSCAPCD and CEC demonstrating that the system can achieve H_2S emissions of no more than 5 lbs/hr.

II. MONITORING AND COMPLIANCE

A. Conditions

1. The Applicant shall as a minimum undertake the following monitoring and compliance programs. Specific details on testing procedures, monitoring equipment specifications, monitoring program duration, and reporting procedures shall be established in the Final Monitoring and Compliance Report on the SMUDGEO #1 project. As described in Conditions 2-6, the Applicant shall submit a monitoring program at least 60 days prior to start up of the SMUDGEO #1 facility to NSCAPCD and the CAM. Continuous H_2S and total volume flow rates measuring methods will be considered. NSCAPCD will advise the ARB and CAM on the acceptability of the programs.

2. The Applicant shall develop and implement a program to measure at least quarterly inlet steam constituents.

3. The Applicant shall develop and implement a program to measure H_2S in the noncondensible gas flow upstream of the Stretford unit and in the off-gas vents of the Stretford unit to the cooling tower.

4. The Applicant shall develop and implement a program to measure H_2S concentrations and liquid flowrate of the condensate H_2S concentrations downstream of the secondary condensate treatment system prior to its release to cooling tower circulating water. The Applicant shall also provide a measuring point upstream of the treatment point, although only one monitoring device shall be required.

5. The Applicant and NSCAPCD shall develop and implement a program to monitor ambient H_2S and TSP concentrations and/or other pollutants prior to and during operation of the SMUDGEO # 1 facility at locations and for a duration to be mutually agreed upon. The Applicant shall submit the monitoring plan to CAM for approval at least 120 days prior to start up of the program.

6. The Applicant shall develop and implement a program to monitor the H_2S abatement system's performance. Results of this monitoring program shall be submitted to NSCAPCD and CAM as follows:

a. The Applicant shall provide a compliance report on the results of the monitoring program within 100 days after the facility has been declared operational. The monitoring activity is to cover a minimum period of 75 days after the time the facility has been declared operational. The report shall contain data obtained during the 75 day monitoring period. A minimum of 30 days of data (not necessarily consecutive days) at 90-110% rated power generation shall be required (a compliance report shall be issued by the Applicant--in any case -- within 100 days after the facility has been declared operational). The report shall contain as a minimum H_2S concentrations in the off-gas and condensate, power generation rates, abatement systems' settings at time of tests, a description of the abatement system's failures, if any, and data obtained in Items 2, 3, 4, and 5 above.

b. If, during the first 75 days of monitoring described in Item a, 90-110% rated power has not been achieved for a minimum total equal to 30 days, monitoring shall continue and a second report is to be submitted within 25 days of obtaining 30 total days at 90-110% rate power. The second report shall include a summary statement of why 90% rated power was not being achieved, and a description of any corrective action taken.

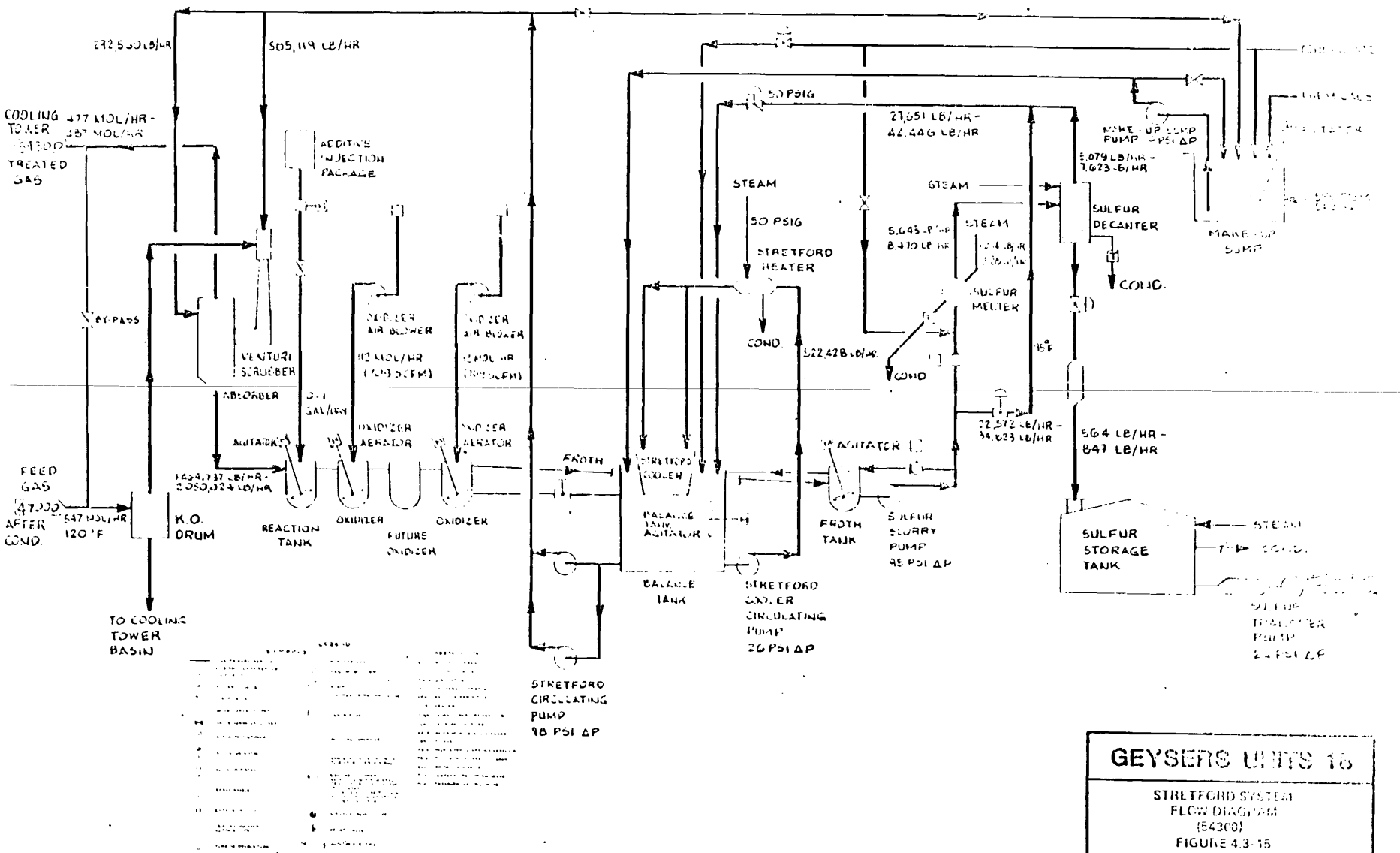
c. Upon review of the information in Items(s) a and b. the Air Pollution Control Officer of the NSCAPCD shall within 30 days present to the Applicant and CAM findings on conformity of air quality standard(s).

d. If the APCO finds that the facility has not met applicable emissions limitations, the Applicant shall prepare and submit its response to the CAM and NSCAPCD. The response shall be submitted within 30 days after the submittal of the report(s) showing noncompliance. The response shall include a description of the mitigation measures or additional control(s) to be applied to the facility or other actions taken to meet the emission limitations. The report will also describe a schedule for implementation of these measures.

e. Upon review of the information in Item d, the CAM and NSCAPCD shall jointly determine whether actions proposed by the Applicant will comply with emission limitations.

f. After the implementation of the approved mitigation measures the Applicant shall conduct monitoring programs described in Items a and b. The NSCAPCD shall perform the actions described in Item c.

7. After obtaining a finding of conformance described in Item 6.c, the Applicant shall continue to monitor the H_2S emissions from the power plant and report on the status of compliance as required by NSCAPCD, but not less than on a quarterly basis. In case of noncompliance, actions identified in Items 6.d, 6.e, and 6.f, will be required to return to a condition of compliance.



GEYSERS UNITS 16

STRETFORD SYSTEM
FLOW DIAGRAM
(54300)
FIGURE 4.3-15

3. SMUDGEO #1

FINDINGS - HEALTH

1. The SMUDGEO project will emit and increase existing ambient air concentrations of hydrogen sulfide, radon-222, ammonia, total suspended particulates, mercury, arsenic, boron, anthraquinone disulfonic acid, and vanadium. In addition, project emissions may increase levels of sulfur dioxide, sulfates, silica, and benzene. These pollutants can adversely impact human health when present in sufficient concentrations.

2. California Ambient Air Quality Standards (CAAQS) have been adopted for regulated pollutants including: hydrogen sulfide, total suspended particulates, sulfur dioxide, and sulfates. Because these standards are based in part on public health protection, compliance with the standards should result in adequate protection of public health.

3. For those pollutants which are not subject to adopted ambient air quality standards (non-regulated pollutants), several agencies and research groups have completed studies which suggested safe levels of maximum permissible ambient air concentrations of certain pollutants. Methodologies and criteria for determining these levels may vary, often resulting in different values.

REGULATED POLLUTANTS:

4. Violations of the California Ambient Air Quality Standards for hydrogen sulfide already occur in the KGRA. The SMUDGEO project may increase the likelihood of future violations.

5. From previous experience with geothermal power plant projects, CEC staff expects potential public health impacts due to emission of total suspended particulates, sulfur dioxide, carbon monoxide, nitrogen dioxide, oxidant, lead, nonmethane hydrocarbons, and sulfates from the project to be insignificant.

6. The Department of Health Services (DOHS) requires that periodic samplings, to determine radon-222 emission rates from geothermal power plants be conducted to verify estimated emission rates and allow for cumulative downwind impact assessment. SMUD agrees to include a radon-222 monitoring program as a condition of certification for the proposed project (AFC, p. 6-4).

NON-REGULATED POLLUTANTS:

7. There is a high probability that, due to current limited use of H_2S abatement systems, negligible amounts of anthraquinone disulfonic acid exist in the background air of the Geysers KGRA.

8. Based on available data, it appears highly improbable that the project's boron emissions would adversely impact public health.

9. The project's emissions, in combination with emissions from other power plants, will increase maximum calculated ambient air concentrations of arsenic, ammonia, benzene, mercury, silica, and vanadium.

10. Because data on actual emission rates, environmental transport, and background ambient air concentrations of nonregulated pollutants in the Geysers KGRA are very limited, estimates of nonregulated pollutant impacts from this project are tentative.

CONCLUSIONS:

1. Emissions from the SMUDGEO #1 plant will contribute to the cumulative impacts of total geothermal development on ambient air pollutant concentrations. The cumulative impact of nonregulated pollutant emissions can not be accurately determined at this time.

2. SMUD shall provide the following:

   a. Baseline ambient monitoring (preoperational) for ammonia, arsenic, benzene, mercury, silica, and vanadium for one year prior to commencement of the project operation. Frequency of monitoring shall be specified in the Compliance Monitoring Report.

   b. Incoming steam monitoring (operational) for ammonia, arsenic, benzene, mercury, silica, boron, and radon-222 quarterly for one year.

   c. Mass balance measurements and calculations for mercury and arsenic. Samples will be collected twice during the second year of commercial operation. Samples should be collected from incoming steam, condensate, noncondensible gas to the Stretford, noncondensible gas to the cooling tower, Stretford solution, cooling tower emissions, cooling tower blowdown, and cooling tower sludge. Mass balance calculations should quantify the emission rate of all incoming mercury and arsenic leaving the power plant. SMUD will prepare a report which includes the sampling results, mass balance calculations, assumptions used, and statistical analysis. This report will be submitted to the USGS.

   d. Ambient monitoring (operational) for ammonia, arsenic, benzene, mercury, silica, boron, and radon-222 if incoming steam monitoring data and atmospheric dispersion analysis indicate the need for such monitoring.

3. SMUD will request recommendations from the Cal/OSHA Consultation Service regarding the adequacy of SMUD's worker health and safety program during project construction. Additionally, SMUD will request the assistance of the Cal/OSHA Consultation Service in evaluating the program proposed for operation of the project. Verification of the program's adequacy will be described in the Compliance Monitoring Report.

Conclusion

1. If the Applicant implements its proposed mitigation measures specified in section 1.3.9 of the AFC and those measures specified in Conditions 1 and 2, the proposed project will comply with applicable laws, ordinances and standards.

Conditions

1. In implementing its proposed mitigation measures, the Applicant shall:

a. Except for the turbine generator set which shall be specified for 90dBA, require equipment manufacturers, where applicable, to supply equipment with a maximum sound level of 85 dBA at three feet. If the manufacturer cannot meet this specification, the Applicant shall undertake appropriate mitigation measures to conform with OSHA/DOSH standards.

b. Route the waste steam to the condenser so that steam will not be discharged into the atmosphere during unit start ups.

c. Ensure to the maximum extent feasible that the steam supplier utilizes a rock muffler or an equivalent noise reducer to mitigate noise during unit outages.

2. To comply with Cal DOSH requirements, the Applicant shall:

a. Post signs on all unavoidably high noise areas.

b. Provide hearing protectors for employees, whenever necessary.

c. Periodically check the hearing of employees, who are routinely subjected to high noise levels.

3. If the applicant receives any complaints of noise due to construction, the Applicant shall immediately conduct an investigation to determine the extent of the problem and shall take reasonable measures to resolve the problem.

4. If the Applicant is informed of public complaints registered with a public official or agency, and the Applicant fails to resolve the problem, the Applicant shall inform the Conservation Division of the U.S. Geological Survey (USGS). If requested by USGS, the Applicant shall implement the following monitoring procedures:

a. Conduct noise surveys at the sensitive receptors registering the complaints and at the facility property line nearest the complaining receptors.

b. The surveys shall be conducted for one construction working day and under circumstances similar to when the complaints were registered.

c. The surveys shall be reported in terms of the L_x and L_{eq} levels.

5. The Applicant shall notify the USGS of the public complaints and the surveys, and of any mitigation measures which the Applicant has applied to resolve the complaint and the results of the mitigation measures taken.

6. Within 90 days after the plant reaches its rated power generation capacity and construction is complete, the Applicant shall conduct a noise survey at 500 feet from the generating station and at the nearest sensitive receptors. The survey shall cover a 24-hour period and be reported in terms of L_x, L_{eq} and L_{dn} levels. (L_x where x = 10, 50, 90).

7. The Applicant shall prepare a report of the survey and a record of any public complaints of noise from operation of the project. The Applicant shall provide this report to USGS.

8. The report shall also detail any mitigation plans and schedules to correct non-compliance in the event that the county or federal standards have been exceeded. Following implementation of mitigation measures, the Applicant shall submit a second report to USGS verifying that the results of the mitigations have alleviated the non-conformance items.

9. Additional noise surveys or reports of off-site operational noise need not be conducted unless the public registers complaints or the noise from the plant is suspected of increasing due to change in the operation of the facility.

10. The Applicant shall conduct on-site noise surveys of the anticipated noise-hazardous areas in the facility when the facility has reached its rated generation capacity. The surveys shall be conducted as prescribed in Title 8, Article 105, California Administrative Code.

11. The Applicant shall make the results of the survey available to USGS within 180 days after the facility has reached its rated power generation capacity and construction is complete. The Applicant shall provide the results of the survey upon request to Cal DOSH and the Commission.

12. The Applicant shall implement its proposed mitigation measures and the above conditions.

4. GEOTECHNICAL, SEISMIC HAZARDS, STRUCTURAL ENGINEERING and RELIABILITY

4a. GEOTECHNICAL

Conclusion

1. There are no geologic conditions within the leasehold that would preclude or impair the siting of the proposed project.

4b. SMUDGEO #1

Seismic Hazard Findings

1. The Applicant will use peak bedrock acceleration values of 0.15g and 0.28g for the Functional Basis Earthquake (FBE) and Extreme Basis Earthquake (EBE) to normalize a response spectrum (figure C.1-9) from ATC-3-06.
2. Response spectra more completely represent seismic ground motions than peak acceleration values alone and are more useful for structural engineering.
3. The most sophisticated seismic hazard analyses performed to date for power plant sites in the Geysers steam field are those by H. C. Shah (document entitled "A Report on Seismic Hazard Analysis, Bottle Rock South Geysers Power Plants", dated May, 1980) and by Keith Feibusch Associates, Engineers (document entitled "Uniform Probability Response Spectra for the Geysers 16 and 18 Sites", dated January, 1980).
4. In terms of site geologic conditions and distance from potential sources of damaging earthquakes (the San Andreas, Maacama, and Rodgers Creek faults), the SMUDGEO #1 site is very similar to the Bottle Rock, South Geysers, Geysers 16 and Geysers 18 sites. Therefore, the seismic hazards at these sites are expected to be similar.
5. The range of spectral acceleration values indicated by the Applicant's response spectrum fall either between or are higher than those of equivalent response spectra (5% damping, 30 year time period) with a uniform exceedance probability of 10% as presented in Shah (1980, figure 32) and Keith Feibusch and Associates, Engineers (1980, Figure A-12).
6. The Applicant's peak acceleration values for the FBE and EBE have

27% and 5% probability, respectively, of being exceeded during a 30-year facility lifetime based on Shah (1980, figure 24).

Conclusion

1. Based on the most sophisticated seismic hazard analyses completed in the Geysers area the probability that the Functional Basis Earthquake and Extreme Basis Earthquake spectral acceleration will be exceeded during a 30-year facility lifetime is about 15% ± 5% and 5%, respectively.

Structural Engineering Findings

1. SMUD will design and construct the power plant and its related facilities in accordance with:

   a. SMUDGEO #1 AFC, Section 1.3.1 (entitled, "Civil and Structural Design"), Appendix B (entitled, "Seismicity Study") and Appendix C (entitled, "Structural Design Criteria").

   b. SMUD's responses (dated, June 23, November 12, and December 22, 1980 and January 9, 1981) to staff interrogatories and review comments.

   c. Title 8, California Administrative Code, adopting American Society of Mechanical Engineers' Boiler and Pressure Vessel Code (ASME BPV Code).

   d. Title 24, California Administrative Code, adopting current edition of Uniform Building Code (UBC) as minimum legal building standards. UBC (1979 edition) is currently scheduled for adoption.

   e. Chapter 7, Division 3, Business and Professions Code, requiring state registration to practice as a Civil Engineer or Structural Engineer in California.

   f. Sonoma County Ordinance 2395, adopting (with appropriate additions or deletions) UBC 76 or equivalent building standard.

   g. Uniform Building Code, 1979 Edition (UBC 79).

   h. American Society of Mechanical Engineers' Boiler and Pressure Vessel Code.

   i. American National Standards Institute, (ANSI), "B 31.1 Power Piping Code."

j. ANSI, "Building Code Requirements for Minimum Design Loads in Buildings and Other Structures" (ANSI A 58.1 - 1972).

k. American Concrete Institute (ACI), "Building Code Requirements for Reinforced Concrete" (ACI 318-77).

l. ACI, "Building Code Requirements for Structural Plain Concrete" (ACI 322-72).

m. ACI, "Commentary on Building Code Requirements for Reinforced Concrete" (ACI 318C-77).

n. American Institute of Steel Construction (AISC), "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings" (AISC SDFESS 78).

o. AISC, "Commentary on the Specifications of the Design, Fabrication, and Erection of Structural Steel for Buildings" (AISC CSDFESS 78).

p. AISC,"Specification for Structural Joints Using ASTM A325 or A490 Bolts, "April 1978 (AISC SST 78).

q. AISC, "Code of Standard Practice for Steel Buildings and Bridges," September 1976 (AISC CSPSBB 76).

r. American Welding Society, "Structural Welding Code AWS D1.1-179" (AWS D1.1-79).

s. AWS, "Reinforcing Steel Welding Code," (AWS D12.1-75).

t. "National Design Specification for Stress-Grade Lumber and Fastenings, 1977" (NDS 77).

u. American Institute of Timber Construction, 1972, "Timber Construction Standards," AITC-100

v. American Iron and Steel Institute (AISI), "Specification for the Design of Light Guage Cold-Formed Steel Structural Members" (AISI SDLCFSS).

w. Steel Joist Institute, "Standard Specifications and Load Tables" (SJI SSLT).

x. American Association of State Highway and Transportation Officials, "Standard Specifications for Highway Bridges", 1977 Edition (AASHTO BRIDGE 77).

2. Criteria set forth in Finding 1 which govern the design of specific structures and facilities, will be used in the final design and construction of each such structure and facility. However, in the case of discrepancies between various criteria, the most stringent criteria will be used unless the Applicant can justify use of a less restrictive criteria to CEC.

3. The Applicant will use the following references as guides in the final design of the power plant and related facilities.

a. Applied Technology Councils, "Tentative Provisions for the Development of Seismic Regulations for Buildings," (NBS-SP-510; ATC-3-06).

b. Structural Engineers Association of California, "Recommended Lateral Force Requirements," 1975, Recommendations and Commentary.

4. In the event that UBC 79 is not adopted by the state (under Title 24, CAC prior to construction, SMUD will demonstrate that facility design conforms with the requirements of UBC 1976.

5. For other than seismic loads, the Applicant will use UBC 79 structural design criteria (augmented as necessary by special live loads) and structural analysis methods.

6. The Applicant will design and construct the SMUDGEO #1 power plant and related facilities to withstand a Functional Basis Earthquake with minor structural damage and loss of power generation for one week or less and to withstand the Extreme Basis Earthquake with no structural collapse and loss of generating capacity for about one year.

7. For seismic loads, the Applicant will use an equivalent lateral force (ELF) method of structural analysis with a base shear coefficient of 0.27 w for noncritical structures and 0.4 w for critical structures (those which are necessary for continued power generation and are excessively costly or time-consuming to repair or replace).

8. The Applicant will check the preliminary seismic design of the Turbine-Generator Building using a dynamic method (STRUDL) of structural analysis to assure that the seismic design will achieve the performance criteria.

9. The Applicant will check the design of the Turbine-Generator Pedestal using a simplified dynamic analysis (i.e., Rayleigh method).

10. For the dynamic analyses, the Applicant will use the response spectra given in ATC-3-06 (Figure C 1-9), normalized to 0.15 g (5% damping) for the Functional Basis Earthquake and to 0.28 g (10% damping) for the Extreme Basis Earthquake. (See Seismic Hazards, Conclusion 1)

11. For the Functional Basis Earthquake, the Applicant will specify and use design stresses for the proposed wooden Cooling Tower structure in accordance with the applicable codes in Finding 1.

12. The Applicant will design and construct bolted and/or welded anchorage on H_2O_2, acid, caustic and chelating agent tanks to withstand a force of 0.87 w using UBC Formula 12.8. All other bolted and/or welded anchorages for Category 1 equipment will be designed and constructed to 0.4 w. In any event, the anchorage criteria shall be consistent with other design and performance criteria.

13. The Applicant shall design and construct tanks containing H_2O_2, acid, caustic and chelating agent, or the containment surrounding these tanks shall withstand a force of 0.87 w.

14. The Applicant will design piping, valves and anchorages to withstand equivalent static loads (ESL) in accordance with ANSI B31.1. The ESL shall be consistent with other seismic design criteria.

15. Should there be discrepancies between criteria and methods set forth in Findings 1, 5, 6, 7, 8, 9, 10, 11, 13, and 14, the Applicant will design to the highest calculated loads in lowest allowable stresses, unless the Applicant can justify use of a less restrictive set of criteria or methods to CEC.

Conclusions

1. The seismic and nonseismic design criteria and analysis methods for critical equipment, and for critical and noncritical structures specified or referred to in the Findings will provide a basis for design for the SMUDGEO #1 power plant and its related facilities that will likely satisfy the Applicant's performance criteria.

2. If the SMUDGEO #1 power plant and its related facilities are designed as specified by the Findings, the design of the unit will likely comply with applicable laws and standards with respect to structural engineering and seismic safety.

3. In order to ensure compliance with the approved performance criteria, design criteria, analysis methods, and with applicable standards, the Applicant will submit the information required by the Compliance-Monitoring Report adopted by the Committee.

Conditions

1. The Applicant shall certify that the final plans and specifications conform to the requirements listed in the Findings.

4d. RELIABILITY

Conclusion

1. If the Applicant implements the proposed procedures and design measures identified in the AFC and in responses to data requests dated April 23, 1980 and May 15, 1980, it is reasonable to expect that the proposed facility will operate at a 90 percent availability factor and 80 percent capacity factor at plant maturity.

Condition

1. The Applicant shall implement its proposed procedures and design measures identified in Conclusion 1.

5. SOLID WASTE MANAGEMENT

Findings

1. The Proposed project will generate the following wastes:
   a. construction debris, waste oil, sewage
   b. Stretford effluent
   c. secondary abatement process sludge
   d. steam condensate cooling tower sludge

2. The secondary abatement process sludge will be deposited in the cooling tower basin along with the steam condensate cooling tower sludge. Since these wastes will be mixed together, both will be disposed of in the same manner.

3. The Stretford effluent, secondary abatement process sludge and steam condensate cooling tower sludge contain substances which are considered to be toxic and hazardous by the Department of Health Services.

4. Toxic and hazardous waste must be disposed of at sites approved for such use by the Regional Water Quality Control Boards (California Water Code Section 14040).

5. The closest sites approved by the Regional Water Quality Control Board for toxic and hazardous waste disposal are located in Middletown and Kelseyville.

6. The Stretford effluent consists of elemental sulfur and the Stretford purge stream. These wastes will be stored in a dumpster and removed

periodically to be sold or to be disposed of at a site approved for such waste.

7. The Applicant will temporarily store the secondary abatement process sludge and cooling tower condensate sludge in the cooling tower basin and will permanently dispose of this waste at a site approved for such waste.

8. The capacity of either of the approved sites at Middletown and Kelseyville is sufficient to accommodate all toxic and hazardous waste generated during the lifetime of the proposed power plant.

9. At the moment, it is unclear which site or sites the Applicant will use to dispose of wastes generated. Accordingly, it is necessary for the Applicant to inform the Commission which site(s) is (are) selected for toxic waste a construction waste disposal before operation of the plant begins.

10. If the sites selected by the Applicant are filled during the lifetime of the plant, it will be necessary for the Applicant to seek approved alternative sites at which to dispose of the toxic wastes generated at the plant.

11. The Health and Safety Code requires that haulers of hazardous wastes (except for saleable wastes) must be registered waste haulers and must comply with applicable sections of California Health and Safety Code (Division 20, Chapter 6.5, "Hazardous Waste Control") and under regulations adopted pursuant to it. SMUD must also comply with the Federal regulations concerning haulers of hazardous wastes found in Title 40 of the Code of Federal Regul ons

12. Hazardous waste generated at the proposed plant will be disposed of only by a registered waste hauler.

13. Construction waste and waste oil will be disposed of at a site approved by the Regional Water Quality Control Board and responsible local agencies.

14. The sewage produced at the site will be treated by SMUD. The liquid effluent will be returned to the steam supplier for injection with the steam condensate into the re-injection wells. The sewage sludge will be removed to an appropriately licensed landfill.

Conclusions

1. If the Applicant implements the measures outlined in Findings 6, 7, 9, 12, 13, and 14, this project will comply with all applicable laws, standards and ordinances.*

Conditions

1. The Applicant will supply the information referenced in Finding 9.

2. The Applicant will either sell their re-usable wastes or seek alternative Class II-A sites at which to dispose of wastes defined in Finding 3 if the sites initially selected by the Applicant reach capacity during the lifetime of the plant.

* This conclusion assumes that the temporary on-site storage facilities described in Finding 7 will comply with applicable laws. Until the staff has had an opportunity to review on-site facilities, a final determination of their adequacy cannot be made.

6. SAFETY

Conclusions

1. If the Applicant implements its proposed measures as specified in section 1.3.10 of the AFC and in response to data requests dated April 23, 1980, the proposed project will most likely comply with fire safety laws, standards, and ordinances and will reduce the hazards due to fire occurring at the plant site.

2. If the Applicant implements its proposed procedures and design measures specified in sections 1.3.6.2 and 6.1.10 of the AFC and in responses to data requests dated April 23, 1980, the proposed project will comply with applicable laws, ordinances, and standards relating to the handling and storage of hazardous, toxic and flammable materials.

3. If the Applicant implements its proposed measures and programs specified in section 6.3 of the AFC, the proposed project will comply with applicable laws, ordinances, and standards relating to worker safety.

Conditions

1. The Applicant shall submit to USGS prior to commercial operation an affidavit signed by SMUD's fire insurance company that the onsite fire protection system is designed, constructed, and operates according to applicable codes and the Underwriter's requirements. If the Applicant is not able to obtain such certification, it may request the Commission and USGS to resolve the matter.

2. The Applicant shall submit to USGS prior to construction copies of agreements with California Department of Forestry and local entities for mutual assistance in connection with fire protection.

3. The Applicant shall design and construct the Stretford system pressure vessels in accordance with the ASME Code, Section VIII, Division 1, to comply with requirements of Chapter 4.1, Title 8, California Administrative Code.

4. The Applicant shall use methods specified in Uniform Building Code, section 2312 in preparing plans and specifications for anchoring tanks for storing toxic and/or flammable materials with the $F_p = 0.87\ W_p$ at working stress design.

5. In selecting the H_2S abatement system supplier, the Applicant shall determine that the system complies with applicable codes through shop and field erection inspections.

6. The Applicant shall submit to USGS prior to construction a letter from Cal OSHA Consultation Service verifying that the Applicant's accident prevention program complies with sections 1509 and 3203, Title 8, California Administrative Code. Prior to operation, the Applicant shall request the Consultation Service to review those sections of the accident prevention program dealing with chemical handling and storage of hazardous materials and airborne contaminant exposure to ensure that it meets the requirements of Title 8, California Administrative Code.

7. The Applicant shall notify USGS of any safety violations, issuances of citations or penalties, and associated actions taken by the Division of Occupational Safety and Health.

8. Prior to commercial operation of the proposed project, the Applicant shall file with the USGS the following documents:

a. Copies of the Manufacturers Data reports that the Stretford pressure vessels have been fabricated in accordance with ASME B&PV Code, Section VIII, Division 1 which is adopted in Chapter 4.1, Title 8, California Administrative Code.

b. Copies of certificates from the manufacturer that the Stretford tanks and permanent H_2O_2 storage tanks, if used, are fabricated in accordance with API 620 and 650 and that H_2O_2 storage tanks are fabricated in accordance with Manufacturers Data Sheet SD-53.

c. Copies of the field inspection reports that Stretford pressure vessels and storage tanks and permanent H_2O_2 storage tanks, if used, are anchored in accordance with the approved plans and specifications.

If the Applicant is unable to supply the documentation, it may request the Commission and USGS to resolve the matter.

9. The determination of adequacy regarding the design of tanks storing toxics and flammable materials are included in the structural engineering findings and conclusions.

10. The Applicant shall implement its proposed mitigation measures and those specified in the above conditions.

3. The construction force required for SMUDGEO # 1 will be in the area during the same time period as the peak cumulative employment engaged in all power plant construction activity in The Geysers.

4. The largest share of current construction worker residences in the KGRA is estimated by PGandE to be in Lake County. The roads traversing the KGRA from Sonoma County are now closed to public traffic. As most impending geothermal development (including the proposed facilities) will be located in the eastern side of the KGRA, Lake County is expected to receive the largest share of the inmigrating construction force.

5. Because of rapid population growth in recent years coupled with fiscal constraints created by the passage of Propositions 13 (1978) and 4 (1979), public service capacities have been strained in Lake County. Population effects of geothermal development have been a major cause of these problems in the Southern reaches of the county.

6. Although Sonoma County is also subject to fiscal constraints attributable Proposition 13 and 4, population effects of geothermal development does not currently constitute a significant adverse effect on communities in northern Sonoma County.

7. Continued geothermal growth will promote adverse cumulative growth inducement effects in Lake County.

8. Applicant proposes a van pool commuter program to allow workers access to the proposed site from Sonoma County utilizing private roads. This will render feasible Sonoma County location to immigrating consturction personnel.

9. The van pool program to allow construction worker commuting from Sonoma County will mitigate the role of the proposed facilities in cumulative geothermal growth effects upon Lake County to the maximum extent feasible.

Conclusions:

1. At this point in time, the van pooling program is the only reasonable mitigation measure the staff has been able to identify to minimize the growth inducing effects of the SMUDGEO #1 facility on Lake County.

d. FISCAL EFFECTS

Findings of Fact

1. Although the steam field for the proposed facilities is located on Federal land, the steam supply field, based upon its possessory interest, will be subject to local property taxation. The steam field developer (AMINOIL) pays the same revenue to Sonoma County as if it were located on private property.

2. The power plant will be owned and operated by a publicly owned utility, and will therefore be exempt from local property taxation.

3. Both Sonoma and Lake Counties will receive a share of federal geothermal steam royalty payments, as provided under the provisions of AB 1905. Annual revenues for Lake and Sonoma Counties are estimated to be approxmiately $43,000 and $116,000, respectively.

4. Both Lake and Sonoma Counties are expected to incur economic costs directly attributable to the construction of the proposed project, apart from growth inducing impacts. These costs consist principally of construction and maintenance costs due to truck-related road damage and miscellaneous expenses.

5. Staff strongly encourages SMUD and the affected Counties to negotiate in good faith to identify the local impacts and to reach resolution.

Conclusions:

1. The Applicant shall be subject to special assessment proceedings in Sonoma and Lake County should either county determine that such proceedings are necessary to ensure adequate improvement or maintenance of roads impacted by the construction of this facility.

9. CULTURAL RESOURCES

Conclusions

1. There are no known archaeological, historical, or ethnographical sites located in the project area.

2. No mitigation measures for cultural resources are necessary.

3. The proposed site and related facility will comply with applicable laws, ordinances and standards for cultural resources.

10. THE ENVIRONMENT: SOILS, WATER QUALITY and WATER RESOURCES, and BIOLOGICAL RESOURCES

10a. SOILS

Soils - Findings

1. The Applicant will effect the following mitigation measures to control soil loss and erosion/sediment transport.
   a. Treatment with dust palliatives during construction operation.
   b. Small debris dams/settling basins or other erosion control techniques will be constructed and maintained in the runoff drainage channels of the plant site area during construction.
   c. Those measures implemented in Item b will be effectively maintained throughout the construction period.
2. The Applicant proposes to limit erosion at the plant site by placing fill on terraced slopes and by trapping sediment in a series of check dams.
3. The Applicant proposes to revegetate the areas disturbed during the construction of the plant, access roads, and transmission towers in accordance with the biological mitigation and monitoring program.
4. Slopes will be monitored for gullying on a periodic basis especially after heavy rainfall. Gullies that form on the slopes will be refilled, shaped, and revegetated.
5. At this time, there are few field measurements of soil loss or rates of soil sedimentation to verify the success of existing erosion control plans employing similar measures for other geothermal projects in the Geysers KGRA.
6. The Applicant agrees to maintain an adequate working level within the sediment collection system.

7. The Applicant will provide proper sediment control at the drain discharge areas. These controls will include riprap and will be maintained to assure sediment containment after vegetation is permanently established.
8. The Applicant proposes to pave and widen, in parts, the entire access road to the plant prior to operation phase.
9. The Applicant agrees to add and maintain additional culverts throughout the access road (see Appendix B to Biological Resources findings and conclusions).
10. The Applicant agrees to dispose of the sediment collected in the check dams in appropriate dump site area (not to be put back on the slopes).
11. The above findings reflect the intent of the basin plan of the NCRWQCB.

Conclusion

If the Applicant's proposed mitigation measures are implemented, the rate of soil erosion and consequent sediment yield to local waterways will be minimized, and the proposed project will comply with applicable laws, standards and ordinances.

Conditions

1. To prevent sedimentation and accelerated erosion of soil at the proposed site, the Applicant shall implement the mitigation measures described in Findings 1, 2, 3, 5, 7, and 9.
2. The Applicant will annually quantify the amount of sediment removed from the proposed sedimentation collection and containment system and will provide this information prior to October each year to the CEC staff and the USGS. If the sediment yield information indicates that the applied mitigation measures are inadequate, the USGS in consultation with the CEC, may require alternative mitigation measures. This condition will be reviewed by the USGS and CEC after 3 years of operation to determine the need for its continuation.

10b. SMUDGEO #1

Water Quality Findings

1. The surface waters potentially affected by the construction and/or operation of the SMUDGEO #1 geothermal power plant and its appurtenant facilities are Cobb Creek, Calm Creek, Big Sulphur Creek, and their tributaries.
2. The potential primary sources of water pollution from the construction and/or operation of this power plant are:
   a. spills of toxic/hazardous chemicals from the H_2S (hydrogen sulfide) abatement processes, the cooling tower basin, or portions of the condensate reinjection system;
   b. the disposal of domestic wastewater;
   c. storm water runoff;
   d. plume drift deposition; and,
   e. erosion and sedimentation.
3. The Applicant agrees to store all chemicals and toxic/hazardous materials in paved and bermed areas.
4. The Applicant agrees to pave, berm, and sump all areas where toxic/hazardous wastes are produced, stored, or handled.
5. All spilled chemicals and wastes will be contained, collected, and either reused within the appropriate system, injected, or disposed of at an approved waste disposal site.
6. The Applicant agrees to pave the power plant pad, with either asphalt, concrete, or asphalt-concrete, to provide an impermeable surface. The impermeability criteria (1×10^{-6} cm/sec, less than one foot per year percolation) will be achieved by paving with and maintaining at least 2" of asphaltic compound.

7. The Applicant agrees to provide berms, drains, and sumps throughout the power plant proper. All drainage will be directed to sumps which will be connected to the cooling tower basin.
8. The capabilities of the power plant pad will be designed to adequately handle the peak volume produced from a 100-year storm and to contain greater than twice the maximum probable accidental spill.
9. The Applicant agrees to provide a secondary sewage treatment system (an aerated septic tank), and chlorination facilities for effluent disinfection.
10. The domestic wastewater will be disposed of with the reinjected condensate. The wastewater discharge line will connect to the reinjection line downstream of the cooling tower basin, the steam suppliers condensate sedimentation basin, or any point where the wastewater could come in contact with personnel or become airborne during normal operation.
11. The Applicant agrees to construct the power plant pad to withstand and to properly drain a 100-year storm.
12. The Applicant agrees to inject into the condensate reinjection facilities all possible rainfall runoff collected on-site.
13. Only after all possible rainfall runoff is being or has been injected (Item 12) will excess runoff to be discharged to the off-site drainage system.
14. The off-site discharge will be to the energy dissipation device for the erosion control-containment system along the northeast face of the power plant fill. (See Finding No. 19).
15. The reinjection of all possible runoff is necessary to assure that any contaminant accumulated on the paved power plant pad are flushed from the paved power plant surface and not discharged to surface waters or drainage courses.

16. The Applicant agrees to utilize the most current and most efficient cooling tower apparatus. The proposed cooling tower drift factor has been identified as .001% of the circulating cooling water rate.

17. Cooling tower drift has been identified as a potential source of water pollution indirectly through vegetation loss and subsequent soil erosion and eventual sedimentation of the waterways. (For more discussion see the Biology Section).

18. The northeast face of the proposed power plant site pad will be entirely fill material. This material will be highly compacted and the slope face is to be a 1½:1 slope. This face has much greater erodability potential than the natural contour and material had.

19. The Applicant agrees to provide an erosion and sedimentation containment and collection control system. This system will be of 2 terraces across the face of the fill, connecting to a concrete lined ditch, slanting from the right hand side of the face, near the toe of the fill. This concrete lined ditch will contain check dams every 20 feet, allowing water to slow and deposit the transported sediment behind these check dams.

20. Water will also be collected from a portion of the fill area to the west of this terraced fill slope. This water will be transported along a rip-rap lined ditch to a surge box/wet-well at a junction with the aforementioned concrete lined ditch.

21. Water discharged from this system will be of the same general appearance and quality as that which would be flowing in the natural drainage, the Cobb Creek drainage.

22. Water from this system will be discharged to the Cobb Creek drainage through an energy dissipation rip-rap apron.

23. The Applicant agrees to provide additional energy dissipation or rip-rap as may be needed.
24. The Applicant agrees to properly revegetate the fill face. (See Biology Section for more discussion).
25. The Applicant agrees to provide drainage and erosion controls along the access road. (See the Engineering and Biology Sections for further discussion).
26. The Applicant proposes a water quality monitoring program, found to be adequate by CEC staff.
27. The Applicant agrees to join a cooperative areawide cumulative impact water quality and aquatic resource monitoring program now being formulated under CEC staff guidance in cooperation with other agencies, power plant and steam developers.
28. The Applicant agrees to widen, to pave, and to provide more drainage outlets and drainage controls along the access road (Fire Road) from the junction at Socrates Mine Road to the power plant site.
29. The Applicant agrees to work with the leaseholders and other adjacent landowners in correcting erosion problem areas in Birdsong Meadow and along the access road (Fire Road).

CONCLUSIONS

1. There will be minimal land disturbance during construction of the power plant pad and the transmission line route, and erosion/sediment controls will be utilized.
2. There will be no intentional discharge of toxic/hazardous materials to surface waters, surface water drainages, or to groundwater acquifers.

3. There will be no discharge of domestic wastes to surface water, surface water drainages, or to potable groundwater acquifers.
4. Cooling tower drift deposition would not directly impact water quality, but may affect water quality indirectly through vegetation die-off and increased erosion.
5. The power plant pad will be adequate to contain greater than twice the maximum probable spill, and will be paved to maximize the containment of all chemicals and wastes and prevent their contamination of surface or groundwaters.
6. The access route (the Fire Road and the actual power plant entrance road) will be upgraded and maintained.
7. There should be no significant water quality or water resource impacts due to the construction or operation of this power plant.
8. The Applicant's proposed mitigation and protection measures as described in these findings are adequate at this time to preserve the quality of Cobb Creek, Calm Creek, Big Sulphur Creek, and their tributaries.

Conditions

1. The Applicant will implement and maintain the mitigation measures as set forth above.
2. CEC and USGS will maintain the right to visit and/or inspect at reasonable times the site of construction of mitigation work.
3. The Applicant shall do water quality monitoring as described in the December 1, 1980, Mitigation and Monitoring Plan through 1985, and shall participate in the KGRA-ARM regional cumulative affects monitoring program.

Water Resources Findings

1. The proposed power plant pad is on a ridge, above any potential flood area from Cobb Creek, Calm Creek, Big Sulphur Creek, or their tributaries.
2. The Applicant agrees to design and construct the paved pad surface to drain a 100 year storm.
3. The Applicant proposes to utilize condensed steam for cooling water, consistent with current practices of like geothermal power plants.
4. Condensed steam is utilized for cooling water make-up. The excess cooling water will evaporate as it passes through the cooling tower or any excess condensate will be reinjected into the steam resource reservoir.
5. Initial start-up cooling water, supplied by the steam developer, will be steam condensate.
6. Approximately 1 million gallons (3 acre-feet) of initial start-up cooling water will be needed to charge the cooling water system.
7. Approximately 3.5 million gallons (11 acre-feet) of construction water will be needed during the 32 month construction period.
8. Approximately 300,000 gallons (1 acre-foot) of potable water will be needed annually for operation and maintenance of the power plant.
9. The Applicant agrees to "truck-in" the domestic-potable annual water as needed. This water will be acquired from an outside source.
10. The Applicant agrees to minimize work in the area where a spring has been identified.

CONCLUSIONS

1. The proposed building site for the power plant will be safe from flood hazards.

2. The proposed power plant will be constructed to adequately drain a projected 100 year storm. This drainage capability will be adequate to protect the power plant from rain-induced flooding.
3. The use of steam condensate for cooling water will eliminate impacts on other water resources of the area.
4. The acquisition or purchase of 1 acre-foot per year of operation and maintenance water from outside sources should pose no threat to the water resources of the area.
5. The acquisition of the 11 acre-feet of construction water over a 2 1/2 year period may impact water resources of the area.
6. The cumulative effect of multiple power plants being constructed simultaneously may severly impact the water resources of the area.
7. There should be minimal impacts to springs, seeps, drainage courses, or other water resource systems of the immediate area by the construction or operation of the proposed power plant.

CONDITIONS

1. The Applicant shall construct the power plant with adequate drainage controls and above the flood zone.
2. The Applicant shall utilize no surface water as the source for cooling water or initial start-up cooling water.
3. The Applicant or its contractor shall identify to the California Energy Commission, the State Water Resources Control Board-Division of Water Rights, the appropriate Regional Water Quality Control Board(s), the United States Geologic Survey, and the counties of Sonoma and Lake, the source(s) of construction water, the time schedule, and the projected withdrawal quantities per month throughout the construction period.

4. The Applicant shall not utilize any surface water as the construction water source without first fulfilling the preceeding condition.

10c. SMUDGEO #1
BIOLOGICAL RESOURCES
AFC FINDINGS AND CONCLUSIONS

Findings

1. The following laws and standards govern the preservation and protection of biological resources identified for this project:

   - o Warren-Alquist Act, Public Resources Code Sections 25003 and 25523.
   - o Federal Endangered Species Act of 1973 and implementing regulations.
   - o Ecological Reserve Act of 1963 and implementing regulations, Fish and Game Code Sections 1580 - 1584.
   - o California Species Preservation Act of 1970, Fish and Game Code Sections 900 - 903.
   - o California Endangered Species Act of 1970, Fish and Game Code Sections 2050 - 2055.
   - o Fully Protected Species Act, Fish and Game Code Sections 3511, 4700, 5000, and 5515.
   - o Fish and Wildlife Protection and Conservation, Fish and Game Code Sections 1600 et seq.
   - o Federal Regulations implementing the Geothermal Steam Act of 1970 [30 USC 1001 - 1015 and CFR 270.34(k)].

2. No rare or endangered plant species listed by state or federal agencies have been reported for the power plant site, and these species are not

likely to occur at the site. No rare or endangered plant species have been reported in studies done for the potentially disturbed areas of the steam field.

3. No significant impact will occur to the bald eagle or peregrine falcon as a result of disturbance to potential foraging area at the project. There is no known significant impact to the ringtail, a small raccoon-like mammal, which is a state designated fully protected species.

4. With the implementation of appropriate mitigation measures, impacts to recreational species will not be significant.

5. No plant species of special concern, such as species on the California Native Plant Society lists, have been identified as occuring on areas subject to disturbance.

6. A purple martin nesting area, a bird species of special concern, may be impacted by drift from the cooling towers.

7. Areas of critical concern which may be impacted by project development include Cobb Creek, Calm Creek, and Birdsong Meadow.

8. When this project is considered by itself and after mitigation measures are implemented, no significant adverse effects on any wildlife or plant species from direct disturbance associated with the power plant site or steam field have been identified.

9. SMUD has proposed mitigation to compensate for potential adverse impacts associated with the power plant development. These measures are specified in the AFC, SMUD's biological resource Mitigation and Monitoring Plan,* in

*Appendix A

the CEC Staff Summary* of the September 30, 1980, Workshop, and the CEC Compliance/Monitoring Report. Mitigation measures include:

a. Sediment control at the power plant site by a check dam drainage system.

b. Protection and habitat improvement of Birdsong Meadow, and erosion control including the paving of road surface immediately following road bed preparation (prior to October 1, 1981), increasing the number of culverts under the road, and the addition of energy dissipators to the culverts.

c. Limiting of vehicular access on nonessential trails.

d. Revegetation of cut and fill slopes at the power plant site and along the main access road prior to the rainy season.

e. Mitigate wildlife losses by chaparral habitat management using controlled burns.

f. Creation of snags in Birdsong Meadow and other locations utilizing trees cut during road clearing (see CDFG letter November 7, 1980).

10. SMUD will implement the biological Mitigation and Monitoring Plan** submitted to CEC on December 1, 1980.

11. No earth moving activities will be conducted during December, January, and February.

*Appendix B

**Appendix A

12. If water from local creeks is used for construction purposes it may adversely affect trout habitat and populations. During such periods SMUD will monitor withdrawals of construction water associated with its project from local sources to assure protection of important aquatic biological resources.

13. Construction activities with potential biological impact will be monitored by a qualified biologist designated by SMUD. This person will assure compliance with the biological resource mitigation and monitoring measures.**

14 Mitigation will not be required for potential effects to the purple martin nesting area or the Calm Creek wildlife watering source unless the monitoring program as defined in the Mitigation and Monitoring Plan* indicates adverse impacts are occurring. In the event of adverse impacts, SMUD will develop mitigation in cooperation with CEC, CDFG, BLM, and USGS staff.

15. The proposed mitigation, items 9 through 14 above, for the power plant portion of this project, when successfully implemented, will reduce cumulative impacts.

16. SMUD will conduct biological resource related monitoring programs which include:

    a. Spring and fall visual assessment and annual infra-red photographic assessment of potential cooling tower drift effects on vegetation near the power plant and assessment of potential effects on the purple martin nesting area.

    b. Water quality and sedimentation sampling of Cobb Creek.

*Appendix A.
** Appendix A, plus agreements indicated in Finding 15 above and verification procedures as contained in the CEC Compliance Monitoring Report.

c. Water quality, sedimentation, and stream flow sampling of Calm Creek.

d. Effectiveness of revegetation and erosion control methods.

e. Effectiveness of measures implemented at Birdsong Meadow and the snag creation plan.

f. Effectiveness of wildlife habitat improvement by controlled burns and information on appropriate time for reburning of selected sites.

The need to continue these programs will be reviewed in 1985.

Conclusions

1. The applicant shall undertake the mitigation and monitoring measures specified in Findings Numbers 9, 10, 11, 12, 13, 14, and 16.

2. With the implementation of the measures specified in Findings Numbers 9 through 14, and 16, the SMUDGEO #1 power plant and related facilities can be constructed and operated in compliance with applicable standards for the protection and preservation of biological resources.

10c. BIOLOGICAL RESOURCES

APPENDIX A

MITIGATION AND MONITORING PLAN
SMUDGEO #1
SACRAMENTO MUNICIPAL UTILITY DISTRICT

OBJECTIVE

The objective of this mitigation plan is to develop measures that will offset the loss of wildlife habitat caused by the construction and operation of the SMUDGEO #1 power plant.

STUDY AREA

All mitigation for SMUDGEO #1 will be conducted in the Aminoil leasehold, Federal Lease Unit No. 7 West CA 1862 or Birdsong Meadow.

MITIGATION METHODS

The overall mitigation plan will consist of (1) sediment control, (2) protection and enhancement of Birdsong Meadow, (3) limited access to nonessential trails near the site, (4) minimum development of the emergency access road, (5) erosion control along the main access road, (6) revegetation of cuts and fills, and (7) controlled burns. Table 1 summarizes the mitigation measures and outlines the implementation schedule.

Sediment Control

A check dam drainage system with cross ditches on the fill slope will be used to control erosion and sediment transport into the Cobb Creek drainage. This system eliminates the need for a large sedimentation basin that would adversely affect additional acreage near the site. Figures 1 and 2 show the sediment and erosion control system planned for SMUDGEO #1. Well pad drawings will be filed separately.

Birdsong Meadow

The access road through Birdsong Meadow will be widened and upgraded only to the extent necessary to accommodate construction traffic. The major impact of this improvement will be to widen the road approximately 8 ft (4 ft on each side). Based on the map shown in the CEC August 4, 1980 memo, about 0.2 acres of meadow habitat will be lost. This constitutes approximately 2 percent of the total meadow/forest acreage.

The small amount of roadside habitat lost to widening and improving the access road through Birdsong Meadow will be offset by paving the road and limiting vehicle access to the meadow. Paving and drainage improvements will reduce or eliminate adverse impacts of runoff and fugitive dust on the adjacent roadside habitats. The paving should also decrease the amount of sediment entering the local drainages during the rainy season.

SMUD, with the permission of the landowner, will correct some gully erosion presently occurring along the south side of the access road in the meadow. This will be done to help offset the loss of habitat from the road widening. Correction of this erosion and drainage improvements should help control the erosion problem as it now exists in the meadow.

Also, with the permission of the landowner, the meadow will be fenced along the access road to prevent nonessential vehicular use of the roads traversing the meadow (Figure 3). Several of the roads or trails in the meadow are abandoned and are returning naturally to meadow habitat. Other roads provide access to PGandE transmission lines and towers and will have to remain, even after fencing. Fencing the meadow will allow the nonessential roads and trails to undergo succession with local species seeding in disturbed areas. Attempts to manage these disturbed areas by revegetating could upset the species composition and diversity that presently exists in Birdsong Meadow. These attempts would also cause additional disturbance to the meadow.

SMUD will attempt to purchase a right-of-way that will allow for some wildlife mitigations along the road. This will include the placement of 3 to 4 large snags along this right-of-way. The snags will be selected from trees removed during road construction. Final locations of the snags will be chosen from sites selected by the California Department of Fish and Game (letter to CEC 11/7/80) and will be within the purchased right-of-way which will permit the snags to be erected by equipment on the road. This will keep meadow disturbance to a minimum. Methods proposed by CDFG (letter to CEC 4/18/80) will be consulted for sizes of holes and erection of the snags.

The cut and fill slopes of the access road through the meadow will be revegetated with grasses and forbs included in the list below. In addition to the revegetation, shrubs will be planted along the border of cut and fill slopes for wildlife use as food and cover. Species to be considered for use are toyon, gooseberry, wild rose, and elderberry.

Mitigation measures performed by SMUD in Birdsong Meadow will be coordinated with those being done by PGandE in the same area. PGandE has proposed a number of mitigation measures in Birdsong Meadow as part of their development of Unit 18. No unnecessary duplication of effort is foreseen at the present time.

Limiting Access to Nonessential Trails

Vehicle access to trails in the vicinity of the power plant will be limited where possible. Some of these trails are used as fire roads; access cannot be prohibited. Access to a number of trails in the area was eliminated when several roads were upgraded and the present cut or fill slopes now prevent vehicular access. There are no plans at this time to place brush along any trails, since the brush will be chipped and mixed with topsoil from the same area for use in revegetating cuts and fills. Large rocks will be placed across the entrance of nonessential trails around the site that are still accessible.

Emergency Access Road

The development of the emergency access road will be kept to a minimum, and access from the main road will be limited by installing a locked gate.

Revegetation

Revegetation shall be accomplished on the cuts and fills of the site and access road by seeding these areas with a mixture of at least six species from the following list. Figures 1 and 2 show the areas of cuts and fills to be revegetated.

Species	
Luna pubescent wheat grass	Agropyron sp.
Wymerra 62 rye grass	Lolium sp.
Blando brome	Bromus sp.
Orchard grass	Dactylis glomerata
Red fescue	Festuca rubra
Lana vetch	Vicia sp.
Sweet clover	Melilotus alba & M. officinalis
Perennial rye grass	Lolium perenne
California poppy	Eschscholtzia california

A mixture of topsoil and chipped vegetation removed during plant site construction will be spread on the slopes prior to hydroseeding.

The hydroseeding will occur in the fall of 1981 and will be performed by applying a slurry of fertilizer and seed to the slopes. A minimum of 45 lb/ac of seed mixed with fertilizer (approximately 500 lb/ac) will be applied during this procedure. The precise species selection and application rate will depend upon the availability of seeds just prior to the hydroseeding. The hydroseeded slopes will be covered with straw mulch, anchored by mechanical punching or a tackifier.

Native and introduced shrubs will be planted in selected areas during the fall of 1982. Native species will be propagated from seeds or cuttings collected near the site. A minimum of four species from the list below will be planted.

Species		Relative Density (%)
Chamise	Andenostoma fasciculatum	10-40
Scrub oak	Quercus dumosa	5-20
Interior live oak	Quercus wislizenii	20-35
Chaparral pea	Pickeringia montana	5-20
Buckthorn	Ceanothus cuneatus	5-20
Buckthorn	C. integerrimus	5-20
Manzanita	Arctostaphylos spp.	10-20
Saltbush	Atriplex sp.	10-20
Yerba santa	Eriodictyon californicum	10-20

The species selection for planting will depend on seed and cutting availability and propagation success. Additional plantings will depend on mortality rates that occur following the initial revegetation effort.

A knobcone/monterey pine hybrid will also be planted in suitable areas of the plant site fill area.

Main Access Road Erosion Control

The existing fire road from Socrates Mine Road to the power plant will be upgraded to accommodate construction traffic. The road will be paved to control sedimentation into local drainages. Cuts and fills will be revegetated to control surface erosion. Figure 4 illustrates the alignment of the main access road.

Controlled Burns

The leasehold for the SMUDGEO #1 project is on federal land. The Bureau of Land Management (BLM) has consented to permitting prescribed burns in this area as part of the SMUDGEO #1 mitigation plan. All burning will be supervised and coordinated by BLM personnel, with SMUD or their consultants supplying input when requested.

The prescribed burning will cover approximately 12 acres in each ten-year period during the life of the plant beginning in January 1982. All burns will be located within the Aminoil leasehold and will be not less than 1/8 mi from the power plant site. Each burn will be approximately two to five acres in size. Factors such as slope exposure, maturity of vegetation, quality of surrounding habitat, topography, increased erosion potential as a result of burning, and the potential increased quality of edge habitat will all be evaluated when selecting burn sites. The amount of chaparral habitat on the leasehold and the potential for increased erosion following burning will limit the number of acres that would be candidate areas for burning. BLM will select burn locations after evaluating these factors. Potential areas are shown on Figure 5.

SMUD will contribute funds to BLM to conduct the prescribed burning. The amount of money SMUD will contribute will be determined by BLM, based on wage rates and equipment supply costs in effect at the time.

Calm Creek

Certain concerns were also raised about project impacts on Calm Creek spring during the July 28, 1980 agency workshop on Biological Mitigation Measures. These included locating the headwaters of the creek, the availability of water quality data, and any impacts that access road construction would have on this water source.

The headwaters of Calm Creek are located about 300 ft upstream from where the creek crosses the road to PGandE Units 9 and 10. (Updated Figures 5.7-3 and Sketch 10 are attached). The creekbed above the road was dry in July 1980. The headwaters are approximately 1,000 ft down the slope from the access road. Figure 2 illustrates the access road configuration where it traverses the upper part Calm Creek drainage. The road design is such that most of the runoff from the road and cut slopes will be diverted to a riprapped discharge on the north-east slope of the site. Some runoff will drain into Calm Creek; however, the discharge will be designed to alleviate erosion.

The headwaters of Calm Creek will not be disrupted or disturbed by access road construction, so no plans are being considered for creating an alternative spring.

Calm Creek was sampled during the SMUDGEO #1 water quality monitoring program. An amended copy of Figure 5.4-2 from the Application For Certification (AFC) is attached showing the actual location of Ca 1.2. The location of this station was incorrect in the original figure. Baseline water quality data for Ca 1.2 is in Table 1. Additional monitoring is outlined in the section below.

MONITORING PROGRAM

The SMUDGEO #1 monitoring program will begin at the onset of plant and access road construction and continue for four years (through 1985). Baseline data for the site has been collected and is included in the AFC. Baseline data on Birdsong Meadow has been collected by PGandE as part of their work for Unit 18. Mitigation measures and monitoring methodologies are briefly discussed below. Table 2 outlines the monitoring program schedule.

SEDIMENT CONTROL

Site Ditches and Check Dams - The condition of the site sediment control system will be checked every spring following the rainy season and again in the fall. Ditches will be cleaned and repaired as necessary at these times.

Access Road Drainage and Paving - Road and culvert conditions will be evaluated in late spring. Repairs will be made as necessary. Special attention will be given to erosion problems.

BIRDSONG MEADOW

Snags - Snags will be checked in the spring and fall to assess nesting activity and overall condition.

Fencing - The fencing and gate in Birdsong Meadow will be closely checked once a year. Incidental surveillance will occur daily by plant personnel. Repairs will be made as necessary.

Gully Erosion - The gully erosion repair will be checked annually following the rainy season. Erosion problems will be noted and corrective actions taken where possible.

Shrub Plantings - Vegetation conditions will be qualitatively evaluated each spring and fall. Any indication of wildlife use will be recorded.

TRAILS

Limiting Access to Nonessential Trails - Blocked entrances to nonessential trails will be checked annually and repaired as necessary. Conditions of nonessential trails near the site and in Birdsong Meadow will be assessed by walking the trails annually. Successional trends and wildlife use will be noted during these walks.

REVEGETATION

Site - Vegetation conditions and growth will be qualitatively assessed each spring and fall through 1985. Additional information recorded will include erosion problems and wildlife use.

Access Road - The monitoring program for access road revegetation will be the same as the conducted at the plant site.

CONTROLLED BURNS

Burn sites will be visited once a year to assess the success of the burning and determine the possible need for a reburn. Burned areas will also be qualitatively surveyed for wildlife use. Data compiled during the Unit 17 detailed study of prescribed burns will also be reviewed and results compared to those gathered at SMUD burn sites.

CALM CREEK

Water quality at Calm Creek will be monitored quarterly at a sampling station located just north of the Unit 9 and 10 Road. Monitoring will begin in March 1981 and continue through December 1985. Parameters analyzed will include temperature, conductivity, pH, dissolved oxygen, flow, and turbidity. In addition, an analysis for heavy metals will be performed once in September 1985. The heavy metal analysis will be the same as that performed in the baseline study.

COBB CREEK

Water quality at Cobb Creek will be monitored in the same manner as Calm Creek. A sampling location will be established at its perennial headwaters just south of the Unit 9 and 10 Road.

PURPLE MARTIN NESTING

Nesting activity for purple martins in the vicinity of the site will be monitored each spring from 1981 through 1985 and compared to baseline data.

DRIFT MONITORING

The major emphasis of the monitoring will be placed on the potential effects of drift on the mixed evergreen forest that grows along the upper part of Cobb Creek. Two 100-meter transects will be located along this part of the drainage above the road to Units 9 and 10. Transects will be walked each spring and fall to determine the external condition of the vegetation. An extensive monitoring program has not been designed for the SMUD project since PgandE is presently conducting a detailed drift monitoring program at Units 5, 6, and 13. If these studies reveal that there are noticeable drift impacts on vegetation surrounding their newer units similar studies will be conducted at the SMUD site. In the meantime, two 100-meter transects will be located along the Cobb Creek drainage and will be qualitatively checked in the spring and fall for evidence of drift impacts.

REPORTS

Reports will be issued annually beginning one year after the initiation of the Mitigation and Monitoring Plan. A final report will be issued four years after its initiation. Most of the data collected will be gathered by visual assessments so no statistical analyses will be performed. Data will be compared between transects and years whenever possible to assess the effectiveness of the mitigation measures and ecological trends.

The annual reports will also discuss problems encountered in implementing any measures and suggestions on how to alleviate them, specific methods for conducting the mitigation plan and indications on the effectiveness of the mitigation measures.

A detailed analysis of the overall effectiveness of the mitigation plan will be presented in the final report. This report will include all data collected, document the impacts of the SMUD project, and compare them to the benefits derived from the Mitigation Plan to evaluate the overall effect of this project on the environment in this area.

TABLE 1

SCHEDULE FOR IMPLEMENTING SMUDGEO #1 MITIGATION PLAN

MITIGATION MEASURE	DATE IMPLEMENTED
Aquatic	
Site Ditches and Check Dams	Summer 1981
Access Road Drainage and Paving	Summer 1981[1]
Birdsong Meadow Gully Erosion	Summer 1981
Plant Site Revegetation	Fall 1981
Access Road Revegetation	Fall 1981
Wildlife	
Snags	Summer 1981
Fencing Birdsong Meadow	Summer 1981
Controlled Burning	Begin Jan. 1984
Shrub Planting in Birdsong Meadow	Fall 1981
Limiting Access to Nonessential Trails	Spring 1981

1 The access road from Birdsong Meadow to the site will be paved following widening and drainage improvements.

TABLE 2

SCHEDULE FOR SMUDGEO #1 MONITORING PLAN

MITIGATION MEASURE	JAN FEB	MAR APR	MAY JUNE	JULY AUG	SEPT OCT	NOV DEC
Site ditches and check dams		X			X	
Access Road Paving and Drainage			X			
Birdsong Meadow Gully Erosion			X			
Plant Site Revegetation		X			X	
Access Road Revegetation		X			X	
Snags		X			X	
Birdsong Meadow Fencing			X			
Birdsong Meadow Shrub Plantings		X			X	
Controlled Burning		X				
Limiting Access to Nonessential Trails			X			
Calm Creek Water Quality		Mar	Jun		Sept	Dec
Cobb Creek		Mar	Jun		Sept	Dec
Drift Effects (1983-1988)			Jun		Oct	
Purple Martin Nesting		X				

10c. BIOLOGICAL RESOURCES

APPENDIX B

BIOLOGICAL RESOURCES WORKSHOP

SMUDGEO #1 PROJECT

SACRAMENTO 9/30/80

SUMMARY NOTES

Birdsong Meadow:

Proposed road will not exceed 30 feet in width through the meadow. This will increase to a maximum of 37 feet as the road leaves the meadow and rises along the hill to the east. The maximum paved surface of the road through the meadow will be 24 feet wide, with the shoulder and drainage ditch accounting for the additional width. The portion of the road through the meadow will be upgraded and paved during the summer of 1981, prior to the start of power plant construction. The entire road will be paved once operation begins.

In addition to improving drainage through the two culverts which now cross the road, two to three other culvert drainages will be added on the hill to direct water flows across the road. Energy disipators will be provided at the outflow from culvert crossings to prevent gully erosion and will be designed to provide a more disperse flow of water across the meadow.

SMUD will make arrangements with the landowner for permission to correct the gully erosion in the meadow caused by the existing road drainage inorder to stabilize the drainage system and to mitigate loss of meadow habitat from road development. SMUD made a commitment to have contacted the landowner(s) and to have arranged for the widest right-of-way possible through Birdsong Meadows by December 1, 1980. They indicated their intention

to have all right-of-way arrangements completed by this date.

In order to protect the meadow from vehicle use, SMUD will construct and maintain a three wire fence with wooden poles along both sides of the road. Agreement was reached between Lloyd Dillon and Lee Leilman that the fence would be constructed first, right after SMUD receives a construction permit. Access to existing roads will be controlled by locked metal gates.

The cut and fill areas of the road through the meadow will be revegetated as soon as possible following construction. Shrub species of food and cover value to wildlife will be planted on the downhill side of the road in undisturbed areas to provide escape areas for wildlife and to reduce wildlife disturbance by creating a visual screen of the road from the meadow.

A few large trees removed during road construction will be used to create 3 to 4 snags in the meadow and at other locations selected by CDFG. John Emig of CDFG agreed to pin-point proposed locations. The methods proposed by CDFG (letter, 4/18/80) will be consulted for the erection of the snags. SMUD indicated their willingness to erect snags, provided this could be done with the use of extension equipment from the road.

In obtaining the road right-of-way, a wide enough strip will be obtained to provide for wildlife mitigation measures along the road. SMUD will also explore further possible measures to assure protection of the meadow (the

lower portion within Lake County) from further development impacts by means such as an agreement, lease, or purchase.

A program will be developed to monitor the effectiveness of the erosion control measures, revegetation, and use of the snags by wildlife. This plan will be submitted by December 1, 1980.

CEC staff will arrange for a workshop between PGandE and SMUD to assure that there will be coordination and no unnecessary duplication of effort regarding mitigation plans for Birdsong Meadow. PGandE is involved as a condition of the development of Unit 18, next to Oatgrass Meadow.

Power Plant Site Sediment Control

Sketches of the Aminoil pad erosion plan were provided at the workshop. CEC staff will forward their comments to USGS.

Calm Creek Spring

Water quality and flow rate monitoring will be conducted on Calm Creek above the road to Units 9 and 10. Details of this monitoring program will be presented in the SMUD monitoring plan to be submitted by December 1980. CEC staff suggested that monitoring of Calm Creek Spring go at least through 1985. This monitoring to cover standard water quality concerns: conductivity, pH, heavy metals.

Access road and drainage system design to the power plant should result in very limited sedimentation from erosion entering the Calm Creek drainage.

Therefore, loss of water available to wildlife from sedimentation of the creek is not expected. Potential loss of flow due to alteration of underground drainage patterns from cut and fill operations at the power plant site and from road construction is not expected to affect the existing drainage into Calm Creek. The proposed water quality and stream flow monitoring will identify any changes to the creek. Since SMUD is not proposing any major alteration to the drainage into Calm Creek they have not committed to maintaining the flow from the spring. (See AFC, p. 5-87B).

Aquatic Monitoring

SMUD has agreed to carry out a water quality monitoring program which includes monitoring of Cobb Creek. They have also been participating and will continue to participate in efforts to establish the regional "KGRA-Aquatic Resources Monitoring" program. The proposed monitoring of Cobb Creek will not include information on fish populations.

Nonessential Trails

As a result of proposed site and road construction, access to existing trails will be blocked except for the emergency access road. Access to trails branching off of the emergency access road will be blocked by placing large rocks across the entrances to the trails.

Controlled Burns

The general sites selected for the controlled burns include areas of mixed chaparrel and chamise. The primary purpose of the burns is to compensate for loss of chaparral and chamise wildlife habitat resulting from the power plant development. The burns are not intended to alter the basic type of

habitat or to serve as wildfire barriers. Specific burn conditions and patterns will be determined by BLM based on leasehold conditions at the time of the proposed burns.

SMUD will develop a monitoring program to assess the effectiveness of the burned areas for wildlife and to provide information on the appropriate time for re-burning of selected sites. This monitoring program will be submitted by December 1980, and will include agreement to routinely monitor re-vegetation and mitigation measures at least through 1984.

Drift Monitoring

SMUD is preparing a drift monitoring program. Emphasis will be placed on monitoring potential effects upon the mixed evergreen forest northeast of the power plant site. This program will be submitted by December 1980.

Revegetation Plan

Plantings will be timed seasonally so that irrigation will not be required. Therefore, irrigation would only be used under extreme conditions. A portion of the well pad to the east of the power plant site will be used for the temporary storage of top soil and chipped vegetation. If the boron from drift represents a problem in revegetating certain areas at the site, a variety of Atriplex sp. which has shown good borate and salt tolerance will be used as an experimental cover. Planting of Atriplex sp. will be monitored closely to determine its effectiveness and to assure that it does not become an invasive species.

Ponderosa pine or a ponderosa pine hydrid will be used at the power plant site to revegetate the north facing slope. For wildlife use as food and cover at the site and at Birdsong Meadow, plantings will include toyon, gooseberry, current, native wildrose and elderberry as appropriate in suitable habitats. The procedure for monitoring the effectiveness of the revegetation efforts will be included in the monitoring plan to be submitted by December 1980.

11. NEED and FINANCING

11a. NEED

Conclusions

1. The forecast and assessment adopted pursuant to section 25309(b) of the Public Resources Code serves as the basis for certification of facilities proposed by utilities.

2. The forecast and assessment adopted in the most recent Biennial Report does as needed, and thus in conformance with such forecast and assessment, any geothermal power plant proposal whose environmental impacts are reasonably mitigable and which complies with applicable air and water quality standards.

3. If the proposed project is shown to be environmentally acceptable, the proposed project will be in conformance with the forecast and assessment adopted pursuant to section 25309(b) of the Public Resources in the most recent Biennial Report.

11b. FINANCING

Conclusion

1. The Applicant will be able to finance the proposed project without excessive rate increases.

APPENDIX B

NSCAPCD DETERMINATION OF COMPLIANCE

Hearing Officer

NORTHERN SONOMA COUNTY AIR POLLUTION DISTRICT

134A North Street Healdsburg, Ca. 95448
Telephone (707) 433-5911

January 28, 1981

California Energy Commission
1111 Howe Avenue
Sacramento, California

ATTENTION: Mr. Buell
SUBJECT: Condition Determination of Compliance (SMUDGEO #1 80-AFC-1)

Dear Mr. Buell,

The District has received at the California Energy Commission hearing on January 12, 1981, a number of comments on its conditional determination of compliance concerning certain corrections and practical problems. Attached is the second amended DOC with those parts added as underlined and those parts deleted as crossed through. The only newly part is finding 13A. The changes are not considered substantive.

If you have any further questions contact me at (707) 433-5911.

Sincerely,

Michael W. Tolmasoff
Air Pollution Control Officer

cc: ARB, George Lew
SMUD, Don Martin

(1)
1/6/81

Findings

1. As originally proposed in the AFC, SMUDGEO#1 (at 72.3 MW-hr) would operate at 100gm/gMW-hr. The Northern Sonoma County Air Pollution Control District (NSCAPCD) determines that operation at 100gm/gmMW-hr would likely cause or contribute to a violation of the state ambient air quality standard for H2S.

2. The Applicant (per telephone call with Don Martin October 9, 1980) will amend the AFC for SMUDGEO#1 such that SMUDGEO#1 will emit no more than 50 gm/gMW-hr H2S.

3. The NSCAPCD staff has reviewed the above amendment, and has concluded that if SMUDGEO#1 is operated at 50gm/gMW-hr for hydrogen sulfide emissions it might possibly ~~cause or contribute to a violation~~ prevent the attainment or interfer with the maintenance of the state ambient air quality standard for H2S, and therefore the project must employ BACT (best available control technology) of 5lb./hr emission rate.

4. The NSCAPCD recognizes the uncertainty in numerical modelling and concludes SMUDGEO#1 should be designed and planned to operate at 5lb/hr. emission rate(BACT), but could emit at 50 gm/gMW-hr. if the background H2S is as low as anticipated.

5. At this time, it appears that a secondary H2S control system will be needed to achieve the emissions level of 5lb/hr.

6. Applicant proposes to meet the applicable H2S emissions limitation by employing a surface condenser, Stretford unit, and secondary H2S control system, if needed.

7. NSCAPCD Rule 455(a) limits geothermal power plant emissions of sulfur compounds, calculated as SO2, to 1,000 ppm or less.

8. SMUDGEO#1 will emit less than 1,000 ppm of sulfur compounds, calculated as SO2.

9. NSCAPCD Rule 420(d) limits geothermal power plant emissions of particulate matter to whichever is the lesser of: a) 0.20 grains per actual cubic foot (ACF), or b) for a source with a process weight rate of 60,000 pounds per hour or more, 40 lb/hr.

10. Under worst case conditions, SMUDGEO#1 will emit less than .20 grains of particulate matter per actual cubic foot and less than 40 lbs/hr (provided the Stretford balance tank cooling tower is properly designed).

11. In the event of any unscheduled outage at SMUDGEO#1 once it is operational, the Applicant agrees immediately to notify the steam supplier for SMUDGEO#1.

(2) 1/28/81

12. The NSCAPCD believes that it is reasonably likely that the steam supplier for SMUDGEO#1 will be able to secure the necessary permits for steam field development.

13. Based upon the review of the Applicant's amendment to the AFC, the NSCAPCD has determined the following condit ons to be necessary to assure compliance with applicable air quality standards:

A. Hydrogen sulfide emissions from the power plant shall be no greater than 51b/hr but could emit at 50gm/gMW-hr provided SMUD shows to the satisfaction of the APCO that from normal geothermal operations (namely power plant as well as stacking operations) H2S impacts in the Anderson Springs area ~~two--and--a--half--years (commencing--May--1981)--prior--to--operation--does--not--exceed--21--ppm~~ does not equal or exceed 22ppb:

(a) for two years prior to operation or,

(b) in the event of non-attainment of (a), for two years after commencement of operation (based on the fact significant source reductions will occur from other sources mid-1984 and after).

~~No~~ An increase in the allowable emission rate for H2S ~~may--be permitted--unless--the--written--concurrence--of~~ will be granted in writing by the NSCAPCD, and ARB if either (a) or (b) is attained ~~is--obtained~~. CEC,

The hydrogen sulfide monitoring program shall be consist of up to three (3) monitoring stations and shall be approvable by the CEC, ARB, NSCAPCD and LCAPCD.

B. Applicant shall return all untreated steam c nd/or condensate to injection points such that hydrogen sulfide will be treated up to the standard of Rule 455(a) during normal power plant operation, plant start-up and plant shut-down. Furthermore, the Applicant shall return all condensates to the condenser in such a fashion so that residual H2S is stripped r nd properly conveyed to the ejector/vacuum system.

C. Mechanical vacuum pumps must be designed such that oil vapors/mist will not be carried to the Stretford facility if the oil would materially decrease the Stretford control efficiency or if particulate emissions to the atmosphere will result (see finding F).

D. ~~If~~ The ~~applicant--employs--an~~ evaporative cooler on the Stretford equipment ~~then--it--should~~ will be designed to comply with particulate emission standards of Rule 420(d).

E. Applicant shall install and operate a continuous H2S monitoring device in the off-gas vent to the ~~atmosphere and the off-gas vent to the~~ cooling tower. The gas analyzer shall have an accuracy of ±10% of full scale for the 0-50 ~~1000-5000~~ ppmv range. ~~This monitor shall have an accuracy of ±5% of full scale for the appropriate ppm range.~~ Data shall be logged on a strip chart or other similar device which will be available for inspection on sight upon request. Applicant shall design for a target data capture of 95% on an annual basis. An audible alarm for H_2S above 10 ppmv shall be incorporated (3) 1-6-81

F. Although SMUDGEO#1 may be licensed on the basis of hydrogen peroxide/catalyst and Stretford/surface condenser system, the applicant may use other means to comply with the hydrogen sulfide emissions limitation of 5lbs/hr. The applicant will submit, no later than two years prior to the scheduled commercial operation data of SMUDGEO#1 project, the conceptual design of the finally selected abatement system, including data demonstrating that compliance with the emissions limitation of 5lbs./hr can be met. Such data shall be submitted to the CEC, the ARB, and the NSCAPCD at least 30 days prior to the date intended for commencement of the design of the proposed system.. Design shall not proceed until the NSCAPCD APCO determines that the material submitted is adequate to demonstrate compliance with the H2S emissions limitation. The APCD shall render a determination no later than 15 days following the receipt of the material from the Applicant.

G. Applicant approved-for-construction drawings of the secondary abatement system shall be submitted to the CEC, ARB and the NSCAPCD at least 30 days prior to the date intended for the commencement of the system. Construction shall not proceed until the NSCAPCD APCO determines that the drawings submitted are adequate to demonstrate compliance with the applicable limitations. The APCO shall render a determination no later than 15 days following the receipt of the material from the applicant.

H. Applicant shall:

a. By September 1, 1982, determine the feasibility of a continuous condensate monitoring system for H2S, including estimated costs, which is capable of ±20 percent accuracy and which requires reasonable maintenance. The Applicant shall submit quarterly reports to the APCO, the ARB, and the CEC on its efforts toward these determinations.

b. In the event that a continuous monitoring system is infeasible or requires unreasonable maintenance, the applicant shall be requried to install an alternative system approved by the APCO.

I. Applicant shall during construction period appropriately treat the construction site to prevent excessive fugitive dust emissions.

J. Applicant, within 60 days of commercial operation, shall demonstrate that the applicable emissions limitations of NSCAPCD rules are being maintained during normal power plant operations. Applicant shall submit a detailed performance test plan to the NSCAPCD at least 30 days prior to such tests. Applicant's proposed test plan must receive NSCAPCD approval before such tests may be conducted to achieve compliance. During performance of the compliance testing a representative of the NSCAPCD shall have the right to be present. (4) 1-6-81

For purposes of these conditions, "normal" operation is defined as operation of the facility with all abatement equipment installed and operating (including plant start up and shut down) to specifications enumerated herein.

Conclusions

1. If the applicant operates SMUDGEO#1 as set forth in findings 11 and 13 the project will comply with all applicable laws, standards and ordinances on air quality.

APPENDIX C

APPLICANT'S STATEMENT RE:

SOCIOECONOMIC IMPACTS IN SONOMA COUNTY

State of California
Energy Resources
Conservation and Development
Commission

In the Matter of:	)	DOCKET NO. 80-AFC-1
	)	
Application for Certification of Sacramento Municipal Utility District's Geothermal Unit #1	)	Applicant's Statement re: Socioeconomic Impacts in Sonoma County

Applicant has endeavored to reach agreement with Sonoma County on the socioeconomic impacts of the SMUDGEO project on the County, but has been unable to come to complete agreement. Applicant therefore proposes the following as mitigation for potential socioeconomic impacts on Sonoma County:

1. ROAD IMPACTS

The Healdsburg-Geysers Road in Sonoma County is not currently adequate to withstand the impacts from truck traffic which will occur as a result of the construction and maintenance of SMUDGEO #1. Therefore:

1.1 SMUD agrees to pay the County $75,889 within sixty (60) days of SMUD's receipt of the California Energy Commission's AFC permit (currently expected to be granted on or about March 25, 1981). This sum is based upon the road impact formula contained in the memorandum attached hereto as Exhibit A and incorporated herein by reference and upon the assumption that 3,780 tons will be hauled over the road because of the construction of SMUDGEO #1. If more than 3,780 tons are hauled over the road because of the construction of SMUDGEO #1, the formula contained in Exhibit A

will be used to calculate the amount due to the County. If less than 3,780 tons are hauled over the road because of the construction of SMUDGEO #1, SMUD shall be refunded the proportionate amount based on the same formula. SMUD shall include a requirement in its construction specifications that a record of tons hauled over the road be kept by its contractors.

1.2 If an assessment district is created to insure adequate improvement or maintenance of roads impacted by the construction of SMUDGEO #1, SMUD shall be subject to special assessment proceedings in Sonoma County initiated by that district, provided that SMUD may offset the payment made pursuant to paragraph 1.1 against any amount assessed for operation and maintenance of the Healdsburg-Geysers Road during construction of SMUDGEO #1. If so other method of financing the road's improvement is created (for example, voluntary agreement between road users) SMUD agrees to pay its share, proportionate to its use, of the improvement and maintenance of the Healdsburg-Geysers Road.

1.3 SMUD will name the County as an additional insured on SMUD's umbrella/excess liability insurance policy covering claims between $100,000 and $500,000 per occurrence. SMUD will indemnify the County from, and hold it harmless against, 50 percent of any claims or causes of action up to the amount of $100,000 per occurrence. The County, with the advice and consent of SMUD, will select the defense attorneys to be utilized. The provisions of this paragraph will apply only to claims and causes of action arising from SMUDGEO #1 construction and only for the duration of construction or until the Healdsburg-Geysers Road is improved, whichever is sooner.

2. PROJECT EMERGENCIES

The SMUDGEO #1 project may result in increased demand on the emergency medical services of the County. SMUD agrees to reimburse the County for actual costs incurred by the County in responding to an emergency medical situation at the project, including evacuation and medical treatment.

3. CUMULATIVE IMPACT HEARING

SMUD agrees to participate in any proceeding conducted by the California Energy Commission to evaluate cumulative socio-economic impacts at the Geysers and further agrees to participate in joint action to mitigate its share of significant cumulative socioeconomic impacts on a voluntary basis with other geothermal developers, provided that such other developers are not given a credit for local property taxes paid by them against any amount contributed to such a joint action program.

Dated: July 1, 1981

Jan Schori
Attorney for Applicant
Sacramento Municipal Utility District

COUNTY OF SONOMA
DEPARTMENT OF PUBLIC WORKS
1117A ADMINISTRATION BUILDING
2555 MENDOCINO AVENUE
SANTA ROSA, CALIFORNIA 95401

DONALD B. HEAD
DIRECTOR OF PUBLIC WORKS

AREA CODE (707)
ROADS 527-2231
TRANSPORTATION 527-2231
SANITATION . . 527-2351
REFUSE 527-2974

DATE: January 19, 1981

TO: Jim Botz

FROM: Ron Nickel

SUBJECT: Damage to Geysers Road due to Construction of S.M.U.D.G.E.O. #1

The Public Works Department has been asked to evaluate the damage to Geysers Road due to the construction of S.M.U.D.G.E.O. #1. The evaluation is based on the information supplied by S.M.U.D.

The anticipated total tonnage to be hauled over Geysers Road is 3780 tons (determined from answers to questions 2 and 4). From our experience the average pay load per truck is 25 tons.

From the answer to question 1 the material will be hauled in 5 axle trucks, therefore:

$$\frac{25 \text{ tons}}{5 \text{ axles}} = 5 \text{ tons per axle}$$

$$\frac{3780 \text{ total tons}}{5 \text{ tons per axle}} = 536 \text{ axle loads}$$

The original road was constructed to a Traffic Index of 6.0 with an anticipated life of 10 years or 23,500 axle loads.

The constant used by Caltrans to evaluate 5 axle trucks is .337 per axle load. The constant includes such factors as weight distribution, unloaded return trip, truck weight unloaded, and seasonal soil condition distribution.

The cost of salvaging the existing structural section and restoring the road to a TI of 6.0 is $500,000 per mile. There are 14.0 miles of road, for a total cost of $7,000,000, therefore:

$$\frac{756 \text{ axle load} \times .337 \text{ constant}}{23{,}500 \text{ axle load life}} = 1.08 \text{ of life}$$

$1.08 \times 7{,}000{,}000 = 75{,}889$ 1980 Dollars

EXHIBIT A

Construction costs have been inflating at a rate of 20% per year.

In addition S.M.U.D. should be required to include in the construction specification that all concrete, gravel and asphalt will be transported over Socrates Mine Road. Any change would be subject to approval of Sonoma County.

DONALD B. HEAD
DIRECTOR OF PUBLIC WORKS

Ron Nickel
Supervising Maintenance Engineer

RN:mm