MASTER

**ERDA SPONSORED NON-ELECTRIC USES
OF GEOTHERMAL ENERGY IN THE
GEYSERS/CLEAR LAKE AREA
APRIL PROGRESS REPORT**

**ERDA CONTRACT No. EG-77-C-03-1326
GEONOMICS PROJECT No. 76.132**

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May 13, 1977

**GEONOMICS, INC.
3165 Adeline St.
Berkeley, California 94703**

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May 13, 1977

GEONOMICS, INC.
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This report covers the period from April 1, 1977 through April 30, 1977.

I. Technical Progress Report

The present combined geotechnical, environmental, socioeconomic impact, and engineering study has been undertaken to identify the different uses to which geothermal heat and fluids could be applied as a direct utilization of resource or as heat utilization.

In the original proposal, six potential geothermal sites were identified, four of which are located in Lake County, one in Sonoma County and one in Napa County:

- Site No. 1: Sulphur Bank - High Valley - Borax Lake Area
- Site No. 2: Thurston Lake - Mt. Konocti Area
- Site No. 3: Collayomi Valley - Middeltown Area
- Site No. 4: High Valley Creek - Cobb - Clenbrook Area
- Site No. 5: Alternate site: Calistoga, Napa County
- Site No. 6: Alternate site: The Geysers Area, Sonoma County

(See attached figure.)

The work accomplished during the month of April is described for each of the five tasks:

Task 1: Geotechnical Assessment, carried out by Geonomics with assistance in geochemistry by Dr. Franco Tonani, Consultant.

Task 2: Potential Agribusiness and Industrial Applications,
carried out by Ag-West, with the assistance of Dr. Richard
Matherson, Consultant.

Task 3: Environmental Assessment, carried out by Ecoview.

Task 4: Socioeconomic Assessment, carried out by Geonomics.

Task 5: Preliminary Engineering Study, carried out by the Ben
Holt Company.

TASK 1: GEOTECHNICAL ASSESSMENT

To date, the geotechnical assessment of the six potential geothermal sites has been completed. All available literature and maps have been compiled and interpreted. Although this literature is limited in information dealing with site specific data, it nevertheless gives sufficient data to give clear indications of the potential presence of hot groundwater reservoirs in each site.

Meetings were held during a two day trip to Lake County with the Lake County Environmental Control Office and Geologist, Mark Walters, who has made several personal observations and has collected data on thermal waters in Lake County. He also supplied literature pertaining to thermal manifestations that was otherwise impossible to obtain. Among this literature was a preliminary map of the ownership and locations of geothermal wells in Lake County. Requests were also made for chemical analyses of geothermal condensates from the Lake County Department of Air Pollution Control.

The lack of more comprehensive, detailed data pertaining to site specific geothermal potential indicates that further studies, specifically in the fields of geochemistry, geophysics and possibly heat flow holes are needed to more firmly establish the locations of geothermal reservoirs in the six potential geothermal sites.

TASK 2: POTENTIAL AGRIBUSINESS AND INDUSTRIAL APPLICATIONS

No written progress report was received for the month of April. Verbal reports were transmitted that a draft of the final report was in preparation which was to be submitted in the subsequent month. A meeting was arranged for exchange of material between Ag-West and Dr. Richard Matherson.

TASK 3: ENVIRONMENTAL ASSESSMENT

Ecoview continued work toward completion of the environmental analysis of the five study sites.

Study Site #1	99% complete
Site #2	70% complete
Site #3	95% complete
Site #4	Complete
Site #5	70% complete
Site #6	90% complete

Two liaison meetings were completed with county planning departments: one with Lake County which included a status report of the project and another with Napa County regarding the County's position on non-electrical uses of geothermal energy in connection with the Calistoga field. They have changed their hard line position and will allow greenhouses and allied agricultural uses to be involved on a small scale, a big step considering their position six months ago.

The Chairman of the Board of Supervisors and Supervisor for the Calistoga district were present as was one other supervisor and the Director of Public Works. They were very concerned about water table degradation and water contamination with boron.

Dr. Jim Neilsen also met with City of Calistoga officials and leading citizens. They are very interested in an integrated program that will speak to water shortage and employment solutions. The tentative flow chart for integration of non-electric uses for environmental report was shown. They are very interested and will commit land, well water, and city resources to further any part of the plan. They also asked Dr. Neilsen and Dr. Matherson to speak at Rotary Club meetings and other service clubs on the subject.

Dr. Neilsen has spent at least one full day in liaison with Ag West over the month.

TASK 4: SOCIOECONOMIC ASSESSMENT

During April, the major efforts of the socioeconomic assessment task were directed towards the assembling of socioeconomic data. Information regarding agricultural and industrial developments which would be most favorable to county residents and its government was in the process of being screened from several taped interviews.

During Phase 0, the assembly of sets of socioeconomic baseline data, to be used selectively in later phases of the project, proceeded. The data acquisition process for the socioeconomic impact study has consisted of several means of obtaining access to primary and secondary sources of data: 1) acquisition of publication; 2) contact with agencies; 3) personal interviews; 4) contact with organizations; 5) site visits, and 6) computer data retrieval and profiling.

Acquisition of publications, contacts with agencies, personal interviews and contacts with organizations were completed during this month.

Site Visit

A field visit by Dr. Tsvi Meidav and Dr. Mae Meidav of Geonomics, and Dr. Walter Randall of Geothermal Resources, Inc. was made to geothermal areas in the Calistoga and Clear Lake areas on April 16 and 17. Dr. Randall is a member of the Advisory Board of this project.

Computer Retrieval and Profiling

Census data for Lake, Napa, and Sonoma Counties were retrieved for the social and demographic profiling of the areas.

A ranking program of California counties was also run which provides relative ranking of three counties on several social, demographic and economic variable. The current estimate of expended funds for computer usage is approximately \$460, which does not include paper costs. Approximately 95 percent of the computer budget has been expended with the work essentially completed.

TASK 5: ENGINEERING PREFEASIBILITY ASSESSMENT

I. Work During Period

Attended mid-project meeting at ERDA-SAN offices in Oakland. Developed a simplified method for estimating the cost of delivered geothermal energy. The method employs tables and graphs to calculate capital and operating costs for the geothermal wells, piping and pumps as a function of well depth, brine temperature and delivery distance. These costs are combined with an estimate of the delivered energy to arrive at an energy cost in dollars per million Btu's.

II. Work Planned for Next Period

Attend a final working meeting at Geonomics, Berkeley. Provide input for the final report.

III. Schedule and Cost

A total of 151 technical man-hours have been expended to date, 85% of project total. Approximately \$4,700 have been spent, 80% of project total.

II. Administrative Progress Report

On April 14, 1977, a technical review meeting was convened in the ERDA/SAN offices attended by the following:

Dr. Tsvi Meidav, Project Manager,	Geonomics
Task 1 leader	
Dr. Richard Matherson, Task 2 consultant,	Agro/Ferma Ind.
Dr. James A. Neilson, Task 3 leader	Ecoview
Dr. Mae Z. Meidav, Task 4 leader	Geonomics
Mr. Anker Sims, Task 5 leader,	The Ben Holt Co.
Ms. Marilyn Eggers, Program Coordinator	ERDA/SAN
Ms. Susan Brechbill, Counsel	ERDA/SAN
Ms. Kath Day, Contract Coordinator	ERDA/SAN

Presentation of the overall project development within the allocated budget and time frame was presented. Technical presentations on the geotechnical background of the project, on the most promising agricultural and industrial applications, the environmental assessment, the socioeconomic assessment, and the engineering feasibility were presented by each of the task leaders. Discussions were held on the original budgeted hours and the division of monies for each task as submitted May 3, 1976 and compared to the final negotiated overhead rates and hours on Dec. 14, 1976.

Notification was sent on April 19, 1977 that in accordance with Clause 2 - Limitations of Funds, Section C, pages 7 and 8 of the contract, the contractors were approaching 75 percent of the total amount allocated to this contract.

Copy of the progress report dated March 7, 1977 was sent to Mr. George Frye of Aminoil, Santa Rosa, California, after patent release and authorization from the program coordinator of ERDA was obtained.

Summary description of the project was requested and submitted to the program coordinator, Ms. Marilyn Eggers, for inclusion in the revised Geothermal Project Summaries.

Meeting of the subcontractors was arranged for the 6th of May in the Geonomics office in order to exchange material on each of the tasks. The tape-recorded minutes of the previous meeting of the subcontractors in the Geonomics office on March 10, 1977, was transcribed and is on file.

In accordance with the request of Ms. Marilyn Eggers, via letter dated April 26, 1977, estimates and the breakdown of the

various tasks for Phase 1 and Phase 2 of the project were prepared. The project work schedules were submitted on May 2, 1977 and will be attached to the May progress report. It appears that the Calistoga site, Site No. 5, one of the alternate sites, is a very likely prospect for development. The project task leaders are also gravitating towards two sites in Lake County for possible development. Thus the projected Phase 1 and Phase 2 work schedules would include applications for three of the sites, two of the four original sites in Lake County, and one of the alternate sites.

The attached newspaper article describing the project appeared in the Clear Lake Observer on April 28, 1977. The article includes an accreditation of ERDA as the funding agency besides a very detailed description of the project. It was written after one of our data gathering field trips to Lake County and was based on an interview between Mrs. Bonnie Hanchett, the editor of the Clear Lake Observer and Dr. Mae Meidav.

Alternative use sought for geothermal

An extensive research project into alternative uses of geothermal energy is being funded by the Energy Research and Development Administration (ERDA) through the private consulting firm Geonomics, Inc. based in Berkeley.

According to Mae Z. Meidav, who heads the socio-economic portion of the study, Phase Zero, now underway, aims to determine and evaluate alternate agricultural processing uses for exhaust heat from geothermal waste fluid which would be generated in four possible areas in Lake County.

The four sites selected for study are Sulphur Bank-High Valley-Borax Lake area; Thurston Lake-Mt. Konocti; Collayomi Valley-Middletown Area, and High Valley Creek-Cobb-Glenbrook. Two alternate sites are designated in Calistoga, Napa County and The Geysers in Sonoma County.

The final report, which is scheduled for completion by June 20, will deal with

geotechnical information regarding existing and potential geothermal resources, their chemistry and flow characteristics in areas which are applicable to direct-heat agricultural and industrial processes, and an estimate of base temperatures. Also, present and projected geothermal waste water disposal sites in the productive dry steam field will be noted.

An assessment is being made of applications of geothermal resources to agriculture in Lake County outlining the optimum agricultural enterprises suitable at each site. It would be of great importance for Lake County to extend the growing season, according to Geonomics, which would alleviate the chronic labor unemployment which is associated now with the relatively short agricultural work season.

Geothermal fluids may be utilized for a variety of industrial processes. Some potential uses, according to Geonomics, could result in environmental improvement from treatment of sewage presently discharged into Clear Lake; controlled algae growth for protein extraction; processing of local agricultural products or raising shrimp or fish.

Public sensitivity to potential environmental degradation requires that any new development of geothermal energy would take environmental impact into consideration as comprehensively as possible, the consultants state.

The study is examining types of projects which would reduce local unemployment or which would suit a relatively mature citizenry. Also, a preliminary assessment is being made of engineering feasibility of transportation of geothermal fluids from their source of supply to a point of utilization. The

study aims at identifying means of developing a diversified agricultural industry in the county which would provide a steady cash flow; reduce the county's high unemployment rate and relieve the nonproductive social burden on county government while increasing county tax revenues.

The study, Geonomics states hopefully, could lead to harnessing potential pollution elements such as hot water, heat, steam, sulfur and other minerals to produce a clean, controlled environmental growth utilizing some or

all of these components; establishing demonstration centers for agricultural use of hydrothermal resources; developing functional hydrothermal farm community, recreation and park areas to serve the population centers of Sacramento and the Bay Area; producing a prototype of farming of the future center which could be used for advanced experiments in food production.

The study is headed by H. Tsvi Meidav, President and Chief Scientist Geonomics, Inc.

[article describing the project which appeared in the Clear Lake Observer, April 28, 1977, Clearlake Highlands, Lake County]