

NEVADA SOUTHWEST REGIONAL GEOTHERMAL  
DEVELOPMENT OPERATIONS RESEARCH PROJECT

Appendix 8 of

REGIONAL OPERATIONS RESEARCH PROGRAM  
FOR DEVELOPMENT OF GEOTHERMAL ENERGY  
IN THE SOUTHWEST UNITED STATES

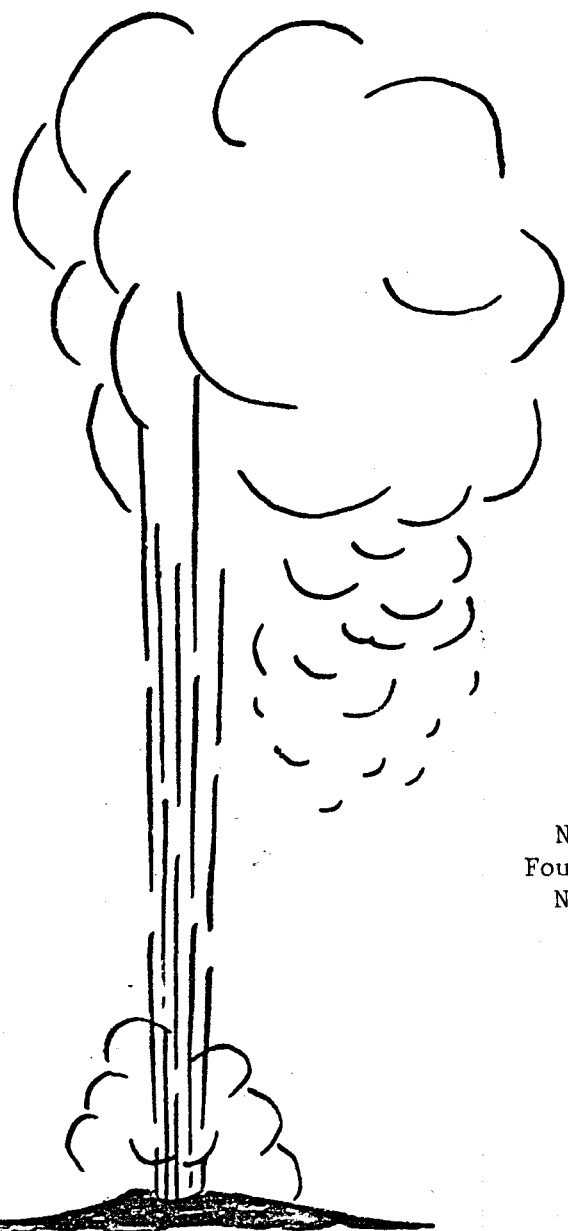
Final Technical Report  
June 1977 to August 1978

Nevada Department of Energy  
Noel A. Clark  
G. Martin Booth III  
Dorismae Weber  
Barbara K. Helseth

January 1979

Work Performed under DOE Contract No. EG-77-S043992  
N.M. Energy and Minerals Department Project No. 76-262  
Four Corners Regional Commission Contract No. 672-066-075  
New Mexico State University Sub-Contract No. 3104-X6

New Mexico Energy Institute at  
New Mexico State University  
Las Cruces, New Mexico 88003



**U. S. DEPARTMENT OF ENERGY**  
**Geothermal Energy**

## **DISCLAIMER**

**This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.**

## **DISCLAIMER**

**Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.**

This report was prepared to document work sponsored by the United States Government. Neither the United States nor its agent, the Department of Energy, nor any Federal employees, nor any other contractors, or their employees, make any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

Reference to a company or product name does not imply approval or recommendation of the product by New Mexico Energy Institute or the U. S. Department of Energy to the exclusion of others that may be suitable.

Printed in the United States of America

Available from  
National Technical Information Service  
U.S. Department of Commerce  
5285 Port Royal Road  
Springfield, Virginia 22161  
Price: Printed Copy \$5.25; Microfiche \$2.25

NEVADA SOUTHWEST REGIONAL GEOTHERMAL  
DEVELOPMENT OPERATIONS RESEARCH PROJECT

Appendix 8 of

REGIONAL OPERATIONS RESEARCH PROGRAM  
FOR THE DEVELOPMENT OF GEOTHERMAL ENERGY  
IN THE SOUTHWEST UNITED STATES

Final Technical Report  
June 1977 to August 1978

Nevada Department of Energy  
Noel A. Clark  
G. Martin Booth III  
Dorismae Weber  
Barbara K. Helseth

January 1979

Work Performed under DOE Contract No. EG-77-S043992  
N.M. Energy and Minerals Department Project No. 76-262  
Four Corners Regional Commission Contract No. 672-066-075  
New Mexico State University Sub-Contract No. 3104-X6

New Mexico Energy Institute at  
New Mexico State University  
Las Cruces, New Mexico 88003

Final Report

NEVADA

SOUTHWEST REGIONAL GEOTHERMAL  
DEVELOPMENT OPERATIONS RESEARCH PROJECT

First Year

Prepared by

Nevada State Team  
G. Martin Booth III  
Dorismae Weber  
Barbara K. Helseth

for the

New Mexico Energy Institute  
New Mexico State University  
Las Cruces, New Mexico

July 7, 1978

## TABLE OF CONTENTS

	Page
List of Tables	v
List of Figures	vi
1.0 Area Scenarios, Nevada - Second Iteration	1
1.1 Introduction	1
1.2 Area Scenarios and Postulated Site Development Schedule for First Electric and/or Direct Thermal Use Plant	1
1.3 Scenario Summary and Conclusions	3
1.4 Area and Site Evaluation Technique	5
1.4.1 Nevada Geothermal Areas	6
1.4.2 Circular 726	6
2.0 Recommendations for Stimulating the Lethargic Development of Geothermal Energy in the State of Nevada	9
3.0 Leasing Activity	11
3.1 Federal Land	11
3.1.1 KGRAs	11
3.1.2 Non-KGRAs	11
3.2 State Land	11
3.3 Private Land	12
4.0 Nevada Drilling Activity	13
4.1 Production Wells	13
4.2 Injection Wells	13
4.3 Temperature Gradient Holes	14
4.4 Exploration	14

TABLE OF CONTENTS (Continued)

	Page
5.0 Environmental Assessment Record (EAR)	15
5.1 EAR's Relationship to Project	15
5.2 Progress to Date	16
5.3 Criteria Used to Evaluate Data from EAR's for Delineation and Compilation - Phase IV	16
6.0 Special Research Project: Study of Nevada State Geothermal Rules and Regulations	21
7.0 U. S. Geological Survey - Menlo Park	22
8.0 Regional Planning Workshop/April 26, 1978	23
9.0 Regional Planning Workshop/June 28, 1978	24
10.0 Geothermal Streamlining Task Force Workshop/ June 28 and 29, 1978	24
11.0 Geothermal Reservoir Case Study Northern Basin and Range	26
12.0 Geothermal Loan Guaranty Program - Brady's Hot Springs	29

APPENDICES

A Nevada State Team Organization	A-1
B Nevada State Team Advisory Committee	B-1
C Humboldt House Data Sheet	C-1
D Exploratory Geothermal Drilling in Nevada	D-1
E Notice of Intent	E-1
F Temperature Gradient Holes	F-1
G EAR's from BLM	G-1
H BLM Map of Nevada State Office District Boundaries	H-1
I Land Use Planning and Management Units	I-1
J Nevada Map of Resource Area, Planning Unit, and District Boundaries	J-1



TABLE OF CONTENTS (Continued)

	Page
APPENDICES (Continued)	
K Components of the Environments for EAR Stipulations	K-1
L Explanation of Land Categories	L-1
M Summary of Nevada State Team Presentation at Regional Planning Workshop, April 26, 1978	M-1

LIST OF TABLES

	Page
1 List of Resource Areas for which there are Postulated Site Development Schedules for Each of Nevada's Geothermal Areas	2
2 Identified Nevada Hot-Water Convection Systems with Indicated Subsurface Temperatures above 150°C (from USGS Circular 726)	6
3 Identified Nevada Hot-Water Convection Systems with Indicated Subsurface Temperatures 90° to 150°C (from USGS Circular 726)	7

LIST OF FIGURES

	Page
1. Physiographic Units Map of the Western United States	27
2. Index Map of Battle Mountain Heat Flow High, Northern Basin and Range Province	28

## 1.0 AREA SCENARIOS, NEVADA - SECOND ITERATION

### 1.1 Introduction

By the end of the first year of the Southwest Regional Geothermal Project, the Nevada State Team has defined over 300 geothermal sites. Because of the multitude of sites and data, scenarios for this first project-year have been completed for the twenty-six Nevada Geothermal Areas, which include all the specific sites. It is not improbable that fully one-third of the sites will eventually prove to be of high to intermediate temperature (i.e.  $> 150^{\circ}\text{C}$  and  $90^{\circ} - 150^{\circ}\text{C}$ ) resources. Low temperature sites are also prominent, not only in number, but also in their distribution - each of Nevada's 17 counties has several such sites.

### 1.2 Area Scenarios and Postulated Site Development Schedule for First Electric and/or Direct Thermal Use Plants

Area scenarios have been developed for each of the twenty-six State Geothermal Areas. For each Area a Postulated Site Development Schedule has been constructed for the first electrical generating plant and/or the first direct thermal use plant (Table 1) to come on line. A total of 31 postulated Site Development Scenarios have been constructed (See Appendix 5 of DOE Report - ALO/3992-1).

Each Area scenario also includes a Composite Postulated Site Development Schedule, which includes a listing of site (Resource Area) names. Those Sites, which presently appear to have a reasonable chance for commercial development by the year 2020, have been given a postulated

TABLE 1. List of Resource Areas for which there are Postulated Site Development Schedules for Each of Nevada's Geothermal Areas.

Resource Area Name	Utilization	State Geothermal Area
The Needles Rocks	Electric	1
Dyke Hot Springs	Electric	2
Cordero Mercury Mine	Electric	3
Hot Sulphur Springs	Electric	4
Humboldt Wells	Electric	5
San Emidio Desert	Electric	6
MacFairlane's	Electric	7
Rye Patch	Electric	8
Golconda	Direct Thermal	9
Leach Hot Springs	Electric	10
Battle Mountain	District Thermal	11
Beowawe Geysers	Electric	12
Darrough's Hot Springs	Electric	13
Elko Hot Springs	Direct Thermal	13
Sulphur Hot Springs	Electric	14
Steamboat Spring-Huffaker	Electric	15
	Direct Thermal	15
Desert Peak	Electric	16
Brady's Hot Springs	Direct Thermal	16
Carson Sink-Alkali Flat, West Side	Electric	17
Soda Lake-Upsal Hogback	Electric	18
	Direct Thermal	18
Dixie Hot Springs	Electric	19
Wabuska Hot Springs	Electric	20
	Direct Thermal	20
Dead Horse Wells- Wedell Springs	Electric	21
Sodaville Springs	Direct Thermal	22
Fish Lake Valley	Electric	23
Warm Springs	Electric	24
Caliente Hot Springs	Direct Thermal	25
Sarcobatus Falt-Beatty	Direct Thermal	26

development schedule.<sup>1</sup> The schedules are given in megawatts where

IMPORTANT  
BEFORE PROCEEDING FURTHER  
READ FOOTNOTE BELOW

utilization would be for electrical power generation, and in quads, where the heat resource would be used directly.

The postulated energy on line for each Site (and Area) is shown for a 30 year resource life to the year 2020: (1) in cumulative form for electrical generation, and (2) in useable reservoir energy for direct use evenly divided over reservoir life. The remaining Sites listed are largely unknown quantities at this time.

The power or energy postulated to be on line is based very largely on subjective judgements, since pertinent factual data is at best sketchy, and normally entirely lacking.

### 1.3 Scenario Summary and Conclusions

The Postulated Development Schedule for Nevada Geothermal Areas for Electric Power Generation (in MWe) and Direct Thermal Utilization (in Quads) is given in Appendix 5 of the DOE Report - ALO/3992-1. The prognosis for development to the year 2020 assumes development of the resource in each

---

<sup>1</sup>Although this report gives numerical energy capacities to sites with specific names, it must be strongly emphasized that the technical criteria for competent estimations is almost entirely lacking. It is fully expected that many electric sites will be incapable of providing a single megawatt, while some, not yet recognized, will provide substantial power. The estimates are largely subjective judgements which are more credible in aggregate for the State than for each specific site.

one of the twenty-six Areas. Thirty-one scenarios covering these Areas include twenty-one for electric power generation and ten for direct thermal utilization.

The first electric plant may be a 20 MWe installation of Phillips Petroleum Co. and Sierra Pacific Power Co. on private land. The scenario shows a Commitment to Development in 1979, with power-on-line in 1982. For the State as a whole power-on-line from 1985 to 2020 would be:

MWe	Year
195	1985
2,120	1990
5,030	1995
7,785	2000
10,120	2005
12,400	2010
14,095	2015
(14,240)	2020

The apparent slackening in energy use (or availability) as shown in Total MWe (from year 2116) and in Total Quads (from year 2005) is statistical in nature. For details, see Appendix 5 of DOE report - AL0/3992-1). Although the reservoirs are assumed to have a life of 30 years for these projections, in actuality they undoubtedly will be much longer. Further, newly developed reservoirs will provide additions not specifically taken into account here. Therefore, the highest best guess for electric, 14,240 MWE in year 2016 and for direct utilization, 0.618 Quads in year 2005, are somewhat conservative.

Direct Thermal utilization is presently grossly underdeveloped at all sites in Nevada. The ten scenarios are indicative of major expansions at presently used sites, plus initiation of direct thermal use in wholly new Resource Areas.

Geothermal Food Processors, Inc. received a DOE Guaranteed Loan in October 1977, and will be on line with their \$3 million food dehydration operation in September 1978. The prognosis for quads available at sites which may show major development between 1985 and 2020 are:

Quads Available	Year
0.144	1985
0.333	1990
0.461	1995
0.571	2000
0.618	2005
(0.618)	2010
(0.618)	2015
(0.618)	2020

The energy (in quads) available for commercial use at each site, is unlikely to be wholly utilized; nor is it assumed to be developed in the optimum or most efficient manner within the prescribed time frame.

#### 1.4 Area and Site Evaluation Technique

The State of Nevada is divided into twenty-six geothermal areas, each area having a number of geothermal sites. The individual sites are by definition those localities where there are thermal springs, thermal well water, and/or geothermal leasing activity.



#### 1.4.1 NEVADA GEOTHERMAL AREAS

Consideration has been given to geothermal site distribution, density, and character; topography, and land status, in outlining each of the twenty-six Areas. To the east and south where prospective sites are fewer and usually of low temperature, AMS sheet boundaries may, in part, form the boundaries of some Areas.

#### 1.4.2 CIRCULAR 726

The resource assessment of thirty-nine high and intermediate temperature geothermal sites in Nevada was presented by the U. S. Geological Survey in Circular 726 (1975) and are shown in Table 2 and 3.

TABLE 2. Identified Nevada Hot-Water convection systems with indicated subsurface temperatures above 150°C (from USGS Circular 726).

---

Beowawe Hot Spring  
Kyle Hot Spring  
Leach Hot Spring  
Hot Springs Ranch  
Jersey Valley Hot Spring  
Stillwater Area  
Soda Lake  
Brady Hot Spring  
Steamboat Springs  
Wabaska Hot Spring  
Lee Hot Spring  
Smith Creek Valley

---

These sites each have surface and subsurface temperatures. The subsurface temperatures are either, (1) measured reservoir, (2) silica geothermometer, or (3) Na-K-Ca geothermometer.

Normally each of the other sites will have a spring or well water temperature, but no geothermometer temperature. In order to make judgments or submit certain assumptions for planning purposes, temperatures, reservoir characteristics, and energy potentials had to be grossly

quantified for a total of 102 sites. This data is shown on the Hot-Water Convections Systems sheet for each Area scenario (See Appendix 5 of DOE Report - ALO/3992-1).

Based upon these semi-quantitative data, along with information on the Non-Technical Components section for each site, Postulated Site Development

TABLE 3. Identified Nevada hot-water convection systems with indicated subsurface temperatures from 90° to 150° C (from USGS Circular 726).

---

Bog Hot Spring	
Howard Hot Spring	
Dyke Hot Spring	
Near Soldier Meadow (Soldier Meadows Hot Springs)	
Double Hot Spring	} Double Hot Spring-Black Rock Hot Spring
Near Black Rock	
Fly Ranch Hot Spring	
Butte Spring (Trego)	
Mineral Hot Spring	
Hot Hole (Elko Hot Springs)	
Near Carlin (Carlin)	
Hot Sulphur Springs (Humboldt Wells)	
Hot Springs Point	
Walti Hot Springs	
Spencer Hot Spring	
Hot Pot	
Buffalo Valley Hot Spring	
Hot Springs (The Hot Springs)	
Golconda Hot Spring	
Sou or Gilberts Hot Springs	
Dixie Hot Spring	
The Needles (The Needles Rocks)	
Walleys Hot Spring	
Nevada Hot Spring (Hind's Hot Springs)	
Darrough Hot Spring	
Warm Springs	
Bartholomae Hot Spring (Klobe Hot Spring)	

---

Schedules were constructed for the first electric power plant and/or the first significant direct thermal project for each Area.

The planner should be aware that the site scheduels suggested are not much more than best guesses for most of the sites. Only when deep exploratory

drilling has penetrated the reservoir at a site, should the planner begin to have confidence in a site specific resource assessment.

Too much dependence must not be put on specific site scenarios to gauge progress of the geothermal industry. Much more is unknown than is understood. For example, four years ago the Desert Peak and Rye Patch (or Humboldt House) geothermal sites of Phillips Petroleum Co., areas without thermal springs - were essentially "blind" prospects. Today these areas are probably the most explored (drilled) geothermal resource areas in Nevada. Brady's Hot Springs, with numerous exploratory test wells was a prime electrical power site just a short time ago. But today there is under construction, a major food dehydration plant (on-line in September 1978) backed by a \$3 million DOE Loan Guaranty.

2.0 RECOMMENDATIONS FOR STIMULATING THE LETHARGIC DEVELOPMENT OF  
GEOTHERMAL ENERGY IN THE STATE OF NEVADA

The foremost barrier to the development of geothermal resources in the State of Nevada is the fact that 86 percent of the lands are under Federal jurisdiction. There is an insignificant amount of State lands to lease; and diligent, workmanlike development on fee lands creates no problems with the private land owner who also holds the original geothermal rights.

Geothermal energy development needs stimulation in several areas simply because it is presently a poor investment in comparison to other energy sources such as oil, gas, coal, and uranium. In order to improve the present status of the geothermal energy industry, within this state, it will be necessary to pay more attention to factors which adversely affect the rate of return of those companies that are undertaking its development. Geothermal energy is in direct competition for investment dollars with the established, energy industries, yet the Federal government has not seen fit to create a fair and equitable environment for it to grow.

Development within the industry is really a long-term educational process of gaining an understanding of the geothermal reservoir, which has little or no similarities to oil or gas reservoirs, or a mineral deposit. The overall tendency of the Federal regulatory and taxing agencies, as well as Congress, is to assume that:

- (1) The geothermal industry can be treated as one that is robust and mature; and a rather attractive investment for venture capital, and
- (2) Everything that could possibly have a detrimental effect on the environment and indirectly, on the "consumer," will be done - - and led by the "big oil and coal companies."

The Institutional Barrier Panel to the Geothermal Advisory Council has reported on institutional and legal barriers to geothermal energy development,

along with many other committees, commissions, and boards for the past several years. Despite continued efforts from within DOE/DGE, industry, and other concerned and knowledgeable parties, who strive to make improvements, the policy and law makers in Washington, D.C. have not remedied the situation - - despite our Nation's growing concern for new energy supplies and conservation.

Positive advancement of geothermal energy development in Nevada can be achieved if provision is made for:

- (1) Amendments to the Federal tax code for the, (a) expensing of intangible drilling costs, and (b) percentage depletion.
- (2) Abolishment of KGRA's.
- (3) Set time limits or timeframes (through administrative directive and/or regulations) for issuance of leases and permits.
- (4) Improve uniformity and consistency of policies and procedures with respect to lease stipulations among the involved agencies. Provide for equal representation of the involved Federal agencies, the Western States, industry, and environmentalists on high-level boards which make policy for the stipulations.
- (5) Improvement of the ponderous and time consuming methods of handling the "necessary" paperwork of BLM and USGS Conservation Division from the time lag of leasing through development.
- (6) Initiation of a Federal investment tax credit for the developer.
- (7) Increasing the total allowable Federal lease acreage a company or individual may hold in a single state - from 20,480 to 51,200 acres.
- (8) The continuation of the DOE/DGE Case History Program - at a higher funding level.
- (9) Continue the present DOE/DGE Loan Guaranty Program.
- (10) Abolishment of taxation of non-productive leases by the State of Nevada.

### 3.0 LEASING ACTIVITY

Eighty-six (86) percent of the land in Nevada is Federally administered. Less than 2 per cent is State land. One-half of the remaining 12 percent is private land, of which is owned by the Southern Pacific Railroad.

#### 3.1 Federal Land

Natural Resource or Public Domain land is administered by the Bureau of Land Management. It has leases totaling 881,971 acres (to February 1, 1978).

##### 3.1.1 KGRAS

Of the total Federal acreage under lease, 152,662 acres were sold in 15 KGRA sales. to date, 23 of the 30 KGRAs in the state have been offered in public sales. A total of seventy-nine leases were sold for an average of 1,930 acres per lease.

##### 3.1.2 NON-KGRAs

The 729,309 acres of Non-KGRA Federal leases (to February 1, 1978) is a poor gauge (i.e. low) as to geothermal potential and industry interest. The average application is approximately three (3) sections (1920 acres). There have been 1374 applications by over 150 different applicants since 1974, for an estimated 2,638,000 gross acres (to September 30, 1977). Included in this are several 100,000 acres of lease applications pending.

#### 3.2 State Land

Less than 2 percent of Nevada is State owned land and therefore participation and interest has been low until very recently. The rapid change is due to the anticipated large scale commercial processing and electrical power generation which is nearing reality, just 60 miles from Reno at Brady's Hot Springs and Desert Peak.

### 3.3 Private Lands

An estimated 12 percent of the land in Nevada is privately owned. A large proportion of this land is leased and/or presently being evaluated. One half of the 12 percent private acreage is owned by the Southern Pacific Railroad, and being evaluated by an experienced operator, Phillips Petroleum Company, with offices in Reno. It is a reasonable estimate at this stage of the Southwest Regional Project, that 6 percent of the remaining private acreage which is held under lease by developers, is difficult to come by. Large percentages of this land is held by developers in the northern and western portions of Nevada, where the resource potential is very large.

#### 4.0 NEVADA DRILLING ACTIVITY

Temperature gradient holes continue to be drilled on Private Lands, and such activities are not recorded with Federal and State Agencies.

Phillips Petroleum Company has submitted a Plan of Operation to drill six (6) geothermal test wells to a depth of 2438 meters (8,000 ft.) on Federal leases in the Rye Patch Reservoir area, Pershing County, Nevada. Included is a handout (Appendix C), data sheet on Phillips Petroleum Campbell E-1, geothermal well at Humboldt House (i.e., the Rye Patch site).

Exploratory drilling in Nevada to date amounts to 64 tests by private companies for the express purpose of developing the energy resource for electrical power generation. All of the drilling has been done on private lands. No deep tests have been on Federal lands, due to institutional barriers.

#### 4.1 Production Wells

There are no wells now on production, but there are numerous wells which have the capability of providing sustained energy for electric power production, commercial processing, and other even lower temperature uses. These wells are included with the wells listed in the (Appendix D) Exploratory Geothermal Drilling in Nevada, a Publication of the Nevada Bureau of Mines and Geology.

There are many other thermal wells, not presently listed which are currently providing (or capable of providing) energy for commercial processing, space and recreational heating in many sections of the State.

#### 4.2 Injection Wells

There is no present need for injection wells, but a number of the exploratory wells listed in Appendix D will undoubtedly be used for such purposes in the not too distant future.



#### 4.3 Temperature Gradient Holes

As with the 64 Exploratory tests referred to above, most of the slim-hole temperature gradient holes have been drilled on private lands. Under these circumstances recordation of such activities is not made with federal or state agencies, and as such is not readily known. Even so, Bureau of Land Management has recorded 67 separate Notices of Intent to carry out temperature gradient surveys (Appendix E). Temperature gradient holes drilled on private lands are estimated to be in the thousands.

#### 4.4 Exploration

Exploration in Nevada is at a high level considering the formidable institutional barriers holding up private development. Notices of Intent (Appendix E) show a serious effort on the part of industry in geophysical techniques as well as drilling. Further, the 1976-1977 Status Report for the Reno Geothermal District of the USGS shows a formidable amount of drilling for this recent period (Appendix F). The anticipated increase in deep tests is startling. At least 25 private, government and educational entities have filed such Notice.

"Casual" exploratory efforts such as geologic mapping and geochemical sampling of spring and well waters are not required to be recorded.

## 5.0 ENVIRONMENTAL ASSESSMENT RECORD (EAR)

Presently our research program is involved with the investigation of Environmental Assessment Records (EAR) for Nevada, as prepared by the Bureau of Land Management (BLM). These reports have been drafted in response to the National Environmental Policy Act of 1969. This Act addresses all Federal agencies to use a systematic, interdisciplinary approach in the decision-making which will affect man's environment. Both the natural and social sciences are integrated in these studies.

The EAR's are prepared in varying detail according to the anticipated impact of the decision on the environment. Therefore, we have found differences in the degree of analysis throughout the 20 (Appendix G) different EAR's received from BLM. Each EAR represents studies prepared for the separate Planning Units, Planning Areas and or Resource Areas which are found within the different BLM districts (Appendices H, I, and J).

### 5.1 EAR's Relationship to Project

The EAR has Several Purposes:

1. The major purpose is to make a recommendation, whether an Environmental Statement is necessary (ES).
2. As an aid in assuring consideration of environmental values at all Bureau levels of planning and decision-making.
3. And as a vehicle for recommending the most effective mitigating measures which can be used by the decision-maker to reduce adverse impacts.

It is the third purpose which is related to our current research into leasing patterns and trends.

Since most of the recommendations referring to leasable Federal Lands were defined in legal descriptions, we plotted the data on overlays for the 18 different AMS Quadrangles which cover the State of Nevada.

The compilation procedure is producing a graphic picture of the various environmental measures affecting the availability of Federal Lands for leasing.

No one has ever compiled this unique information in a graphic form using a State-wide or Regional format.

When these overlays are used in conjunction with our previously compiled leasing and drilling data, interesting patterns develop. Some areas of potential geothermal development show large blocks of land with various environmental stipulations. Another pattern in one of the most potential areas of Nevada, the Black Rock Desert, delineates sizeable areas which have been excluded from leasing, pending additional environmental studies, while a considerable number of geothermal lease applications are waiting for a final land use decision.

#### 5.2 Progress To Date

The mitigating measures recommended in the EAR as to which lands are to be excluded from leasing, and which lands may be leaseable with particular stipulations, most certainly qualifies for inclusion, the Institutional factors which are being considered in the geothermal development programs. These recommendations can influence, as well as alter decisions, such as, leasing, exploration, development, financing, plant sites, power line corridors, and others.

This environmental data, along with the above mentioned leasing and drilling compilations, can be easily included in our Data Base System (RPPM) and is comparable with other retrievable information now in the data base storage.

#### 5.3 Criteria Used to Evaluate Data from EAR's for Delineation and

##### Compilation - Phase IV

The first step towards defining the criteria to be used, was to prepare a list of all the possible components described in the suggested or recommended stipulations for each EAR. Some of the various elements are: sage

grouse, bighorn sheep, Historic Places, archeological sites, withdrawn areas, and so on. Each component was given a number so delineated areas on the map could be identified. (Appendix K)

The second step was to establish an "intensity guide." This is the identification of KEY WORDS used to describe an area as to the recommended stipulations. Some of the KEY WORDS are:

critical  
prime  
detrimental  
hazardous  
multiple use  
extremely  
extinction  
withdrawn  
site-by-site  
proposed  
unique  
endangered  
excluded or exclusion from

Next, an explanation was developed so the two previous steps would have a framework in which they could be applied.

Two categories were defined:

- I. Lands Excluded from Leasing
- II. Leasing - with restrictions

Each of these categories was then sub-divided into two (2) groups each (Appendix L).

I. Lands Excluded from Leasing

- a) No Leasing: (Solid lined areas colored red with either an encircled component number, or component number without a circle.)

This entire group is composed of selected areas where NO LEASING IS PERMITTED.

The determination as to whether the element number will be encircled or not is a judgement based on the intensity of the described lands AND the types of, and, number of elements for the described area. All of these areas will be described in EAR's as:

"Land Recommended to be Excluded from Leasing"

An Example:

Certain archaeological sites may be recommended for exclusion from leasing, but will not be described as intense areas of recommendation. So, these areas will appear as red areas, outlined with a solid line and have the element number, 21 within its boundary; or, an area designated as a Historical Place which has the qualification or has been proposed for the National Register of Historical Places will be identified with an encircled 23 and be colored red.

But, if the archaeological site is identified as an EXTREMELY VALUABLE site, then the number 21 will be encircled; likewise, if the historic Place is ALREADY on the National Register of Historic Places it will be shown or identified with the number 22 which will be encircled. It is almost certain that no future leasing will be allowed in these areas. (Virginia City is an example of both).

The point here is the application of the KEY WORDS and the text.

The Pine-Nut Walker EAR is a fine example of NO Leasing recommendations with KEY WORDS.

- b) No Leasing-Pending: (Solid lined areas colored yellow with or without component numbers).

These areas have been identified as lands where there is PRESENTLY no leasing being permitted pending additional environmental studies. No land use decisions or project impacts upon the area can be or will be determined before these reports are completed.

It is possible these lands will be available for leasing in the near future, or perhaps, be permanently excluded from leasing.

The key for this group is:

"Pending additional environmental studies"

or

"Site-by-Site Study as leasing is proposed"

## II. Leasing-With Restrictions

- a) Non-Critical: (Dashed lined areas colored blue with associated component number).

This group includes lands subjected to the additional stipulations of restricted seasonal entry, as well as those stipulations already contained in the Geothermal Resource Lease, Sections 14, 18, and 19.

The key here is the ABSENCE of such key words as Critical.

b) Critical: (Dashed lined areas colored orange with a component number).

These lands are also subject to the regular stipulations found in the Geothermal lease, but have had ADDITIONAL stipulations placed upon the lessee.

All of these lands are defined as CRITICAL areas and will have special stipulations, such as:

- no surface entry
- no surface water use
- site-by-site consideration
- "prior to . . ."
- seasonal constraints (associated with critical habitat area)
- buffer zones
- siting improvements
- equipment limitations
- special reclamation techniques

The key to this group is the application of such words as "critical, endangered, natural areas," and so on.

Tonopah EAR is a fine example of the special stipulation.

Note: In each designated area, more than one element number may be applicable.

6.0 SPECIAL RESEARCH PROJECT: STUDY OF NEVADA STATE GEOTHERMAL

RULES AND REGULATIONS

The professional services of Allan Buchanan were obtained to assist the Nevada State Team in a special research study into the State geothermal rules and regulations. Mr. Buchanan, who specializes in the energy field, holds a Public Intern position with the Nevada Department of Energy.

This on-going project details any and all rules and regulations on the State, county and municipality level which are of a direct concern to the development of geothermal energy. While conducting numerous personal interviews, in both the public and private sector, emphasis was directed at: possible legal and institutional constraints, case histories and experiences pertaining to direct thermal uses, and opportunities for development.

Numerous specific questions posed by the Core Team were also answered as a result of this study.



## 7.0 U. S. GEOLOGICAL SURVEY - MENLO PARK

A two day series of conferences with the U. S. Geological Survey at Menlo Park, California was initiated by members of the Nevada State Team in February 1978. This visit proved to be a very useful and productive one for the Team.

The meetings were held with personnel from the divisions of Conservation, Water Resources and Geology. Included in the discussions and data received, were the following:

- (1) Geothermal Leasing Procedures
- (2) KGRA classification and evaluations
- (3) Geothermometry
- (4) Low and High Temperature research work
- (5) Water Resource data
- (6) Circular 726

The USGS continues to be a valuable source of information and referral for the Nevada State Team.

## 8.0 REGIONAL PLANNING WORKSHOP/APRIL 26, 1978

The Southwest Regional Geothermal Development Operations Research Project, due to a organizational change in DOE/DGE, has recently come under the Rocky Mountain/Basin and Range Region.

The Nevada State OR Team was represented at the planning workshop in Salt Lake City, on April 26, conducted by personnel from DGE Headquarters, DOE Idaho Operations (ID), DGE Nevada operations, U. S. Geological Survey, EG&G Idaho, Inc. (the prime contractor to ID), and the Earth Science Laboratory of the University of Utah Research Institute.

Detailed short-and long-term planning activities included all aspects of stimulation of geothermal energy development from resource definition through utilization, encompassing presently existing programs as well as new programs.

Presentations by State Teams addressed the following topics (Summary of Nevada State Team presentation, Appendix M):

- (1) Location and nature of known geothermal sites with emphasis on the best sites in terms of development of electrical generating capacity or direct heat uses.
- (2) Potential for further resource discovery.
- (3) OR data generated to date and its applications.
- (4) Recommendations for future DGE programs and initiatives.

#### 9.0 REGIONAL PLANNING WORKSHOP/JUNE 28, 1978

A second regional planning workshop was held in Salt Lake City on June 28 to review and comment on the DOE/DGE Draft Regional Hydrothermal Development Plan for the Rocky Mountain/Basin and Range Region. Representatives of industry also participated.

#### 10.0 GEOHERMAL STREAMLINING TASK FORCE WORKSHOP/JUNE 28 and 29, 1978

The Interagency Geothermal Streamlining Task Force held a meeting open to the public in Salt Lake City on June 28 and 29, in order to assist the Interagency Geothermal Coordinating Council (IGCC) in carrying out its mandate:

"for assessing legal, -environmental, regulatory, and other aspects of Federal, State, and Local government policy as they relate to geothermal energy and for developing recommendations for changes and improvements in related laws, policies and procedures, and for examination of other institutional aspects of geothermal energy, including non-governmental aspects."

Specifically, the Task Force is to develop recommendations to IGCC for appropriate action to implement the President's commitment to Congress that:

"The Department of the Interior and Agriculture will streamline leasing and environmental review procedures to remove barriers to development to geothermal resources."

The commitment was prompted by the fact that although the Geothermal Steam Act was passed nearly seven and one-half years ago, there is still no commercial production of this resource on Federal lands.

It is widely known that the cumbersome Federal leasing and permitting program constitutes a major deterrent to timely development. As long as the inhibiting influence of the regulatory program clouds the rate of development on Federal lands, the effects of other impediments cannot be fully and accurately assessed.

The Geothermal Streamlining Task Force has undertaken a study which includes (1) a comprehensive analysis of the elements of the present program designed to identify the sources of delay and quantify delays which are actually occurring; and (2) to determine the potential effects upon program performance of a series of options for program modification. The effectiveness of alternative options will be assessed in terms of their relative ability to support the Department of Energy's projected geothermal power-on-line schedule while adequately protecting the public interest and the environment.

The study will also incorporate input provided by the public, industry, environmental groups, and state agency officials through a series of workshops held in the western states in June.

The Salt Lake City workshop was one such meeting which reviewed and commented on the series of options developed by the Task Force, for modifying the geothermal leasing and permitting program. In addition, discussion groups formally presented suggestions for additional alternatives.

## 11.0 GEOTHERMAL RESERVOIR CASE STUDY, NORTHERN BASIN AND RANGE PROVINCE

The Nevada Operations Office of DOE on March 31, 1978 solicited a proposal to provide data not now publicly available and from within the northern portion of the physiographic region known as the Basin and Range province (Figure 1.). More specifically, the area of interest is the high heat flow anomaly known as the Battle Mountain Heat Flow High, the approximate boundaries of which are depicted in Figure 2.

The great portion of the State of Nevada's most prospective geothermal sites are included in the subject of this RFP. The program will make available to the public this data which DOE acquires from successful proposers.

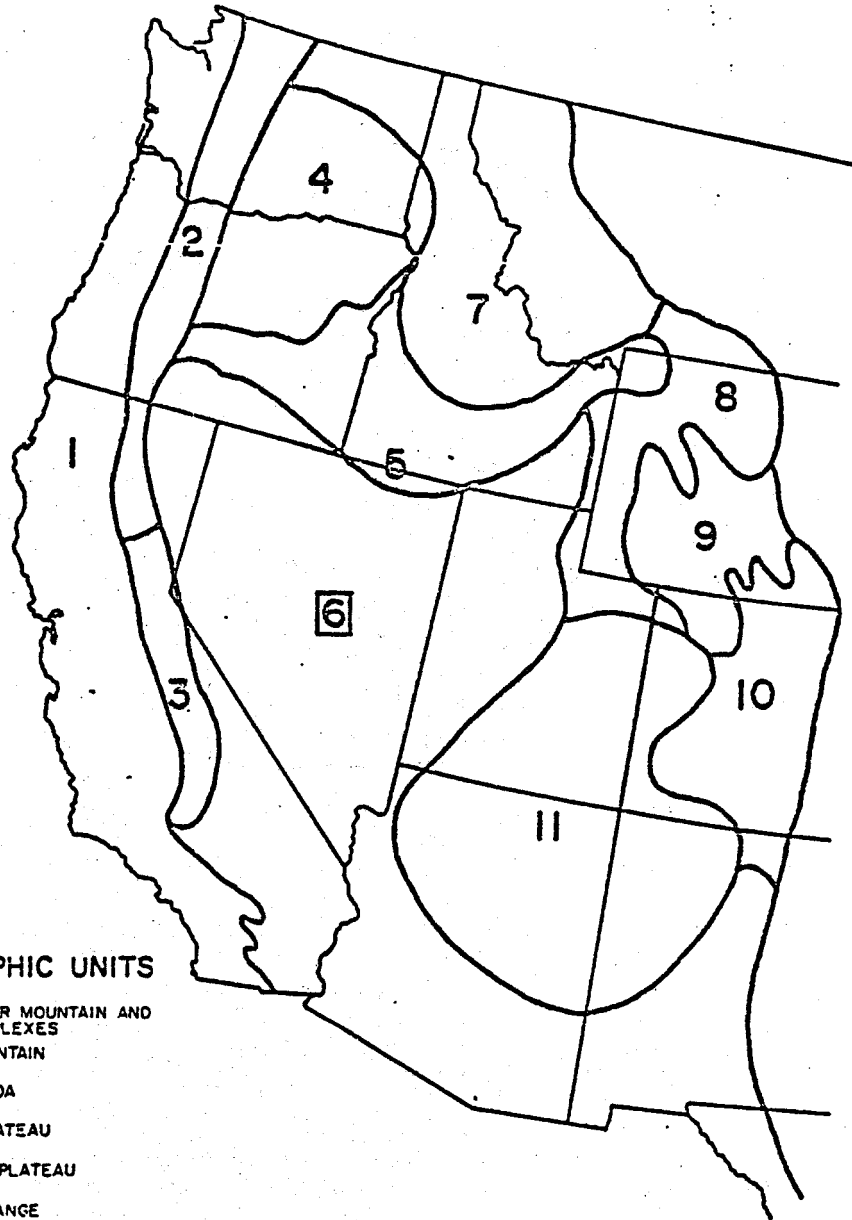
The proposers may:

- (1) Perform an investigation and offer new geological data, geothermal reservoir data, and/or reservoir engineering studies.
- (2) Offer existing data of the above type obtained from prior investigations.
- (3) Offer any combination of (1) and (2).

The objectives of this case study is to further the development of commercial geothermal energy by accumulating and publishing for use by industry and the public at large case history information on geothermal reservoirs in order to stimulate exploratory drilling as well as to reduce the risk and cost of exploration and reservoir assessment and the uncertainties of reservoir engineering.

In order to obtain a greater range of data applicable to the evaluation of a geothermal resource, it is anticipated that several of the proposals received will be selected for awards. DOE has allocated approximately \$1,300,000 to be used for contracts resulting from this RFP during fiscal year 1978. Additional funding is anticipated to be approximately \$8 million, and expected to be made available during FY 1979 subject to appropriation by Congress.

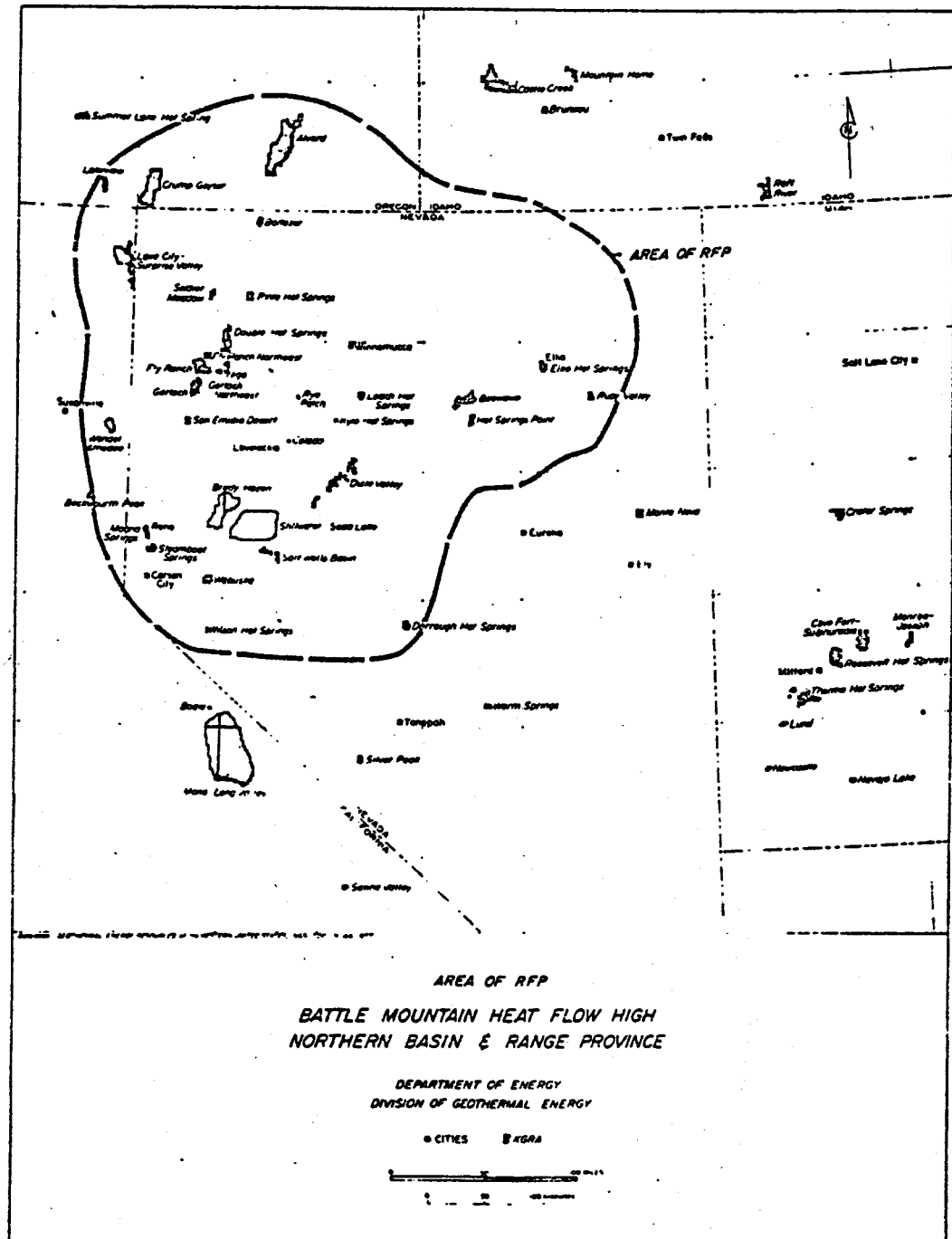
FIGURE 1.



PHYSIOGRAPHIC UNITS

- 1 PACIFIC BORDER MOUNTAIN AND VALLEY COMPLEXES
- 2 CASCADE MOUNTAIN
- 3 SIERRA NEVADA
- 4 COLUMBIA PLATEAU
- 5 SNAKE RIVER PLATEAU
- 6** BASIN AND RANGE
- 7 NORTHERN ROCKY MOUNTAIN
- 8 MIDDLE ROCKY MOUNTAIN
- 9 WYOMING BASIN
- 10 SOUTHERN ROCKY MOUNTAIN
- 11 COLORADO PLATEAU

FIGURE 2.



Closing date for proposals was May 30. Final selection of winning proposals should be complete by Mid-July, with contract negotiated to be complete by the end of August to late September.

12.0 GEOTHERMAL LOAN GUARANTY PROGRAM-BRADY'S HOT SPRINGS

The Nevada Team contacted Mr. Allen Craigmiles, Vice President of Nevada National Bank, and one of the State Advisors, for information concerning the Geothermal Guaranty Loan Program. Nevada National Bank is the lender for the new direct-geothermal use food processing plant at Brady's Hot Springs.



APPENDIX A

NEVADA STATE TEAM ORGANIZATION

The Nevada State Team Leader, G. Martin Booth III, was selected by the Nevada Department of Energy in conjunction with the Nevada Bureau of Mines and Geology, University of Nevada-Reno, to head the Nevada State team.

Noel A. Clark, Director  
Department of Energy  
1050 East Williams  
Suite #405  
Carson City, Nevada 89701  
(702) 885-5157

John H. Schilling, Director  
Nevada Bureau of Mines & Geology  
Mackay School of Mines  
University of Nevada-Reno  
(702) 784-6691

Nevada State Team consists of:

G. Martin Booth III  
Team Leader  
4275 Hackamore Drive  
Reno, Nevada 89509  
(702) 747-3463

Doris Weber  
Research Assistant  
Providing research work,  
compilation and drafting

Barbara Helseth  
Research Assistant & Office Support  
Providing research work, compilation,  
secretarial and bookkeeping

The New Mexico Energy Institute at New Mexico State University proposed to perform regional operations research in the development of geothermal energy resources for the Division of Geothermal Energy, U. S. Energy Research and Development Administration, and the Four Corners Regional Commission.

An Agreement was entered into in October 1977, between the Nevada Department of Energy and Nevada Bureau of Mines and Geology, University of Nevada-Reno, the latter being contracted to perform the Geothermal research activities necessary under the Subject of the sub-contract which Nevada DOE had executed with the Regents of New Mexico State University; Sub-Contract 3104-X6.

APPENDIX B

NEVADA STATE TEAM ADVISORY COMMITTEE

Noel Clark Chairman	Director Nevada Department of Energy
Robert Forest	Exploration Office Phillips Petroleum
John H. Schilling	Director Nevada Bureau of Mines & Geology
Leslie B. Gray	Lawyer Gray & Brooks Magma Power Company
John Arlidge	Nevada Power Company
Dick Richards	Sierra Pacific Power
Jack Cardinali	Nevada Dept. of Conservation & Natural Resources Division of Water Resources
Ernie Gregory	Nevada Dept. of Conservation & Natural Resources Division of Environmental Protection
Allen Craigmiles	Vice President Nevada National Bank
Susan Orr	Consumer Representative Citizen Alert
Keith Ashworth	Senator Nevada Legislative Representative
Gil Flores	Delegate to the State FCRC Office of Economic Development

APPENDIX C

HUMBOLDT HOUSE DATA SHEET

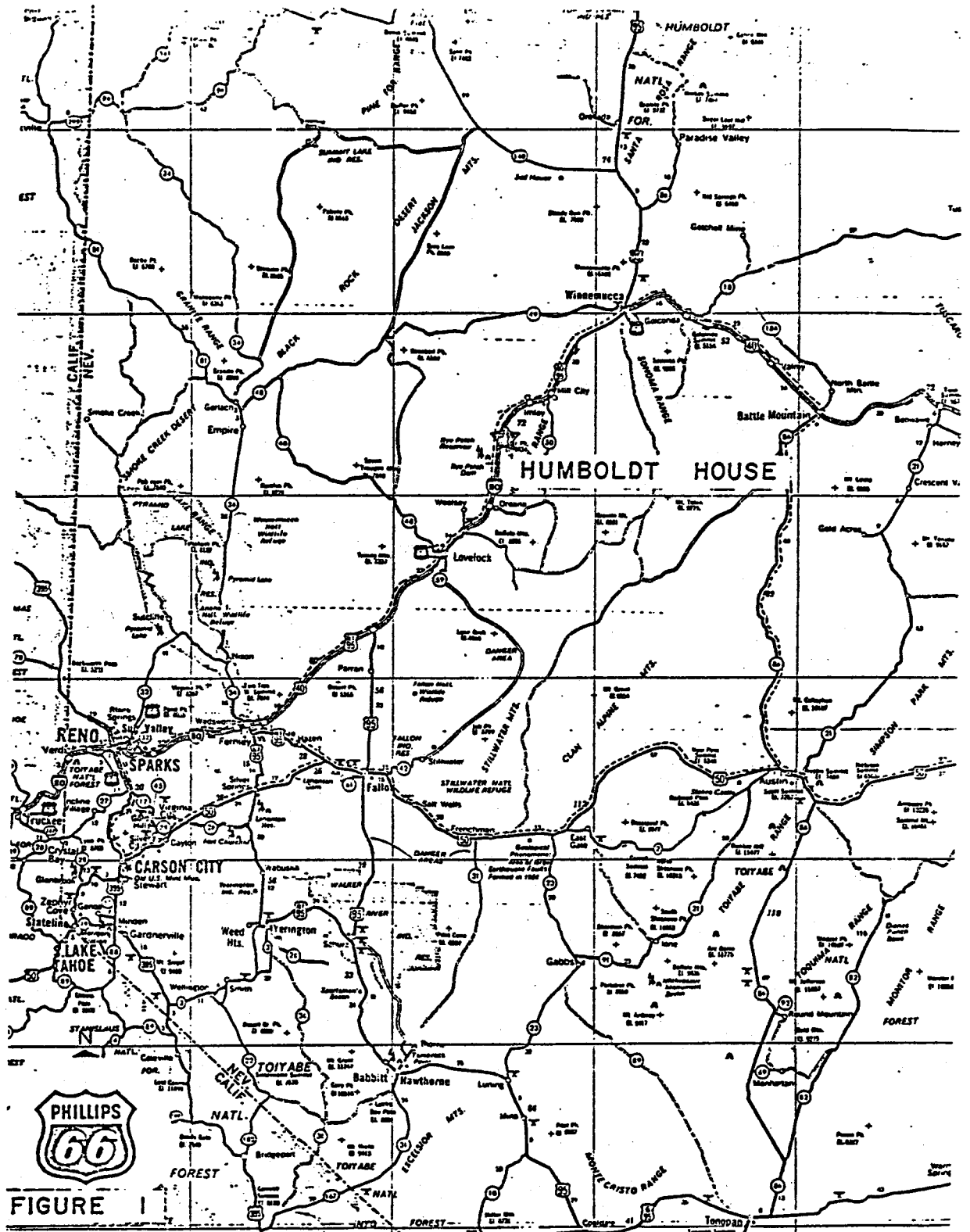


FIGURE 1

## HUMBOLDT HOUSE

The Humboldt House geothermal prospect is located in Pershing County, Nevada along highway I-80 about halfway between Lovelock and Winnemucca (Figure 1). The geothermal prospect is mostly within the Humboldt River Valley graben which is situated between fault blocks of the Humboldt Range on the east, the Eugene Mountains on the north, the Antelope Range on the west and the Trinity Mountains on the southwest.

In December 1977, Phillips Petroleum Company completed the Campbell E-1 geothermal well. This well was completed at 1835 feet due to severe lost circulation problems in middle Triassic carbonate rocks. The relatively impermeable Tertiary valley fill appears to act as a caprock. It is possible that the finely clastic Grass Valley Formation could also act as a caprock. Geothermal fluids can only enter the Campbell E-1 well in the lowest 82 feet of borehole which is uncased.

These fluids reach the well head as hot water with total dissolved solids of 4500 ppm. This hot water flashes to steam which would be used to generate electricity. Initial tests indicate that the steam from this well is capable of producing about seven megawatts of electricity. If this test and future tests are encouraging, additional wells will be drilled. Power would then be generated by a utility company and presumably fed directly into the transmission line just east of the well head.

Seven megawatts of electricity is enough electricity to supply approximately 7,000 people with power. The total population of Winnemucca and Lovelock, the two largest towns in the Humboldt area, is approximately seven to ten thousand people.

#### HUMBOLDT HOUSE CHRONOLOGY

- October 24, 1973 Entered into Exploration and Option Agreement with Southern Pacific Land Company covering Southern Pacific lands in Nevada, California and Utah.
- January 14, 1975 Commenced drilling shallow temperature-gradient holes.
- May 14, 1976 Commenced drilling 5 stratigraphic tests to 2000' for temperature and geologic information
- March 8, 1977 Completed drilling stratigraphic tests.
- November 3, 1977 Commenced drilling Campbell E-1.
- December 9, 1977 Completed drilling Campbell E-1.

APPENDIX D

Exploratory Geothermal Drilling  
in Nevada

Updates and corrects Table 1 of Nevada Bureau of Mines and Geology

Report 21

Geothermal Exploration and Development in Nevada through 1973.



Operator	Name	API No.	Location	Depth	Compl. Date	MAX. Temp. (°F)
Churchill County)						
Brady's Hot Springs						
Magma Power Co.	Brady No. 1	27-001-90000	NF/4, NE/4, SW/4, S12, T22N, R26E	700'?	1959?	
Magma Power Co.	Brady No. 2	27-001-90001	NE/4, NE/4, SW/4, S12, T22N, R26E	241'	1959?	330
Magma Power Co.	Brady No. 3	27-001-90002	SE/4, SE/4, NW/4, S12, T22N, R26E	610'	1961?	335
Magma Power Co.	Brady No. 4	27-001-90003	SE/4, SE/4, NW/4, S12, T22N, R26E	723'	1961?	
Magma Power Co.	Brady No. 5	27-001-90004	NW/4, SW/4, NE/4, S12, T22N, R26E	593'	1961?	
Magma Power Co.	Brady No. 6	27-001-90005	NW/4, SW/4, NE/4, S12, T22N, R26E	770'	?	
Magma Power Co.	Brady No. 7	27-001-90006	NW/4, SW/4, NE/4, S12, T22N, R26E	250'	?	
Earth Energy Inc.	R Brady EF No. 1	27-001-90007	S12?, T22N, R26E	5062'?	1964	414
Earth Energy Inc.	Brady Prcs. No. 1	27-001-90008	S12?, T22N, R26E	1758'?	1965?	355
Union Oil Co. of Calif	SP-Brady's No. 1	27-001-90010	NE/4, SW/4, SE/4, S1, T22N, R26E	7275'	1974	371
Magma Energy Inc.	SP-Brady No. 2	27-001-90013	NE/4, NW/4, SE/4, S1, T22N, R26E	4446'	1975	
Magma Energy Inc.	SP-Brady No. 8	27-001-90014	NE/4, SE/4, NW/4, S12, T22N, R26E	3469'	1975	
Desert Peak Area						
Phillips Petroleum Co.	Desert Peak No. 29-1	27-001-90011	SE/4, SE/4, S29, T22N, R27E	7662'	1974	
Phillips Petroleum Co.	Desert Peak B No. 21-1	27-001-90015	S/2, SE/4, S21, T22N, R27E	4150'	1976	
Phillips Petroleum Co.	Desert Peak B No. 21-2	27-001-90016	NE/4, NE/4, S21, T22N, R27E	3192'	1976	390
Stillwater						
O'Neill Geothermal Inc.	J.I. O'Neill, Jr. -Reynolds No. 1	27-001-90009	NE/4, SW/4, SW/4, S6, T19N, R31E	4237'	1964	265
Union Oil Co.	Weishaupt No. 1	27-001-90017	Lot 2, S6, T19N, R31E	4000'±	1976	
Union Oil Co.	Weishaupt No. 2	27-001-90018	Lot 4, S5, T19N, R31E	4000'±	1977	
Union Oil Co.	De Braga No. 1	27-001-90019	Lot 1, S1, T19N, R30E	4000'±	1977	
Soda Lake						
Chevron-Phillips	Soda Lake No. 1-29	27-001-90012	C, SE/4, SE/4, S29, T20N, R28E	4306'	1974	
Chevron Resources Co.	Silver Lake No. 44-5	27-001-90020	S5, T19N, R28E	4700'	1978	
Lee Hot Springs						
Oxy Geothermal Inc.	Federal No. 72-33(K)	27-001-90021	NW/4, NW/4, S34, T16N, R29E		1978	

Operator	Name	API No.	Location	Depth	Date	(°F)
(Douglas County)						
Wally's Hot Springs						
U.S. Steel Corp.	Wally's No. 1	27-005-90000	SE/4,NW/4,NW/4,S22,T13N,R19E	1268'	1962	181
U.S. Steel Corp.	Wally's No. 2	27-005-90001	SW/4,SW/4,NW/4,S22,T13N,R19E	499'	1962	
(Eureka County)						
Beowawe Geysers						
Magma Power Co.	Beowawe No. 1	27-011-90000	NE/4,SE/4?,NW/4,S17,T31N,R48E	1918'	1959?	
Magma Power Co.	Beowawe No. 2	27-011-90001	NW/4?,NW/4,S17,T31N,R48E	715'	1959?	
Vulcan Thermal Power Co.	Vulcan No. 1	27-011-90002	NW/4,SE/4,SW/4,NW/4,S17,T31N,R48E	638'	1961	414
Vulcan Thermal Power Co.	Vulcan No. 2	27-011-90003	NE/4,SE/4,SW/4,NW/4,S17,T31N,R48E	655'	1961	407
Vulcan Thermal Power Co.	Vulcan No. 3	27-011-90004	NW/4,SW/4,SE/4,NW/4,S17,T31N,R48E	796'	1961	407
Vulcan Thermal Power Co.	Vulcan No. 4	27-011-90005	NE/4,SW/4,SE/4,NW/4,S17,T31N,R48E	767'	1961	410
Vulcan Thermal Power Co.	Vulcan No. 5	27-011-90006	,S17,T31N,R48E	237'	1963?	
Vulcan Thermal Power Co.	Vulcan No. 6	27-011-90007	NW/4,SW/4,NE/4,S17,T31N,R48E	478'	1963	282
Sierra Pacific Power Co.	Sierra No. 1	27-011-90008	C,NW/4,SE/4,SW/4,S17,T31N,R48E	927'	1964?	
Sierra Pacific Power Co.	Sierra No. 2	27-011-90009	C,NE/4,SW/4,S17,T31N,R48E	418'	1964	
Sierra Pacific Power Co.	Sierra No. 3	27-011-90010	NW/4,SE/4,SW/4,NW/4,S17,T31N,R48E	2052'	1965	
Sierra Pacific Power Co.	Sierra No. 4	27-011-90011	NW/4,NE/4,NW/4,S17,T31N,R48E	1005'	1964?	240
Magma Energy Inc.	Batz No. 1	27-011-90013	SW/4,NW/4,NE/4,S17,T31N,R48E	5447'	1975	
Springs Point (Crescent Valley)						
Magma Power Co.	(?) Hot Springs Point No. 1	27-011-90012	S1, 2, or 11, T29N, R48E	410'	1965	
Chevron Oil Co.	Hot Springs Point No. 1	27-011-90014	NW/4,SW/4,NW/4,S1,T29N,R48E	2335'	1975	

Operator	Name	API No.	Location	Depth	Comp. Date	max. temp. (°F)
(Humboldt County)						
Hot Springs Ranch Magma Power Co.	Tipton No. 1	27-013-90000	SW/4,NW/4,SW/4,S4,T33N,R40E	3071'	1974	
(Lander County)						
Beowawe Geysers						
Chevron-American Thermal Resources	Ginn No. 1-13	27-015-90000	C,SE/4,SE/4,S13,T31N,R47E	9563'	1974	
Chevron U.S.A., Inc.	Rossi No. 21-19 -Beowawe No. 1	27-015-90001	SW/4,NW/4,NW/4,S19,T31N,R48E	5680'	1976	

Operator	Name	API No.	Location	Depth	Compl. Date	Max. Temp. (°F)
Nye County)						
Wabuska Hot Springs						
Magma Power Co.	Wabuska No. 1	27-019-90000	S16?, T15N, R25E	488'	1959	
Magma Power Co.	Wabuska No. 2	27-019-90001	SE/4, NE/3, SW/4, S16, T15N, R25E	532'?	1959	
Magma Power Co.	Wabuska No. 3	27-019-90002	NE/4, SE/4, SE/4, S16, T15N, R25E	2223'	1959	227
Fernley (Hazen)						
Magma Power Co.	Hazen No. 1 (?)	27-019-90003	SW/4, S18?, T20N, R26E	750'	1962	275+
Magma Power Co.	Hazen No. 2 (?)	27-019-90004	S18?, T20N, R26E	300'?	1962	
Magma Power Co.	Hazen No. 3 (?)	27-019-90005	S18?, T20N, R26E	300'?	1962	
Magma Energy Inc.	Fernley No. 1	27-019-90009	SW/4, SW/4, SE/4, S24, T20N, R25E	3668'	1974	
Hind's Hot Springs						
U.S. Steel Corp.	Hind's No. 1 (?)	27-019-90006	SW/4, SE/4, S16, T12N, R23E	?	1962?	150
U.S. Steel Corp.	Hind's No. 2 (?)	27-019-90007	SW/4, SE/4, S16, T12N, R23E	?	1962?	
U.S. Steel Corp.	Hind's No. 3 (?)	27-019-90008	SW/4, SE/4, S16, T12N, R23E	?	1962?	
(Nye County):						
Darrrough Hot Springs						
Magma Power Co.	Darrrough No. 1 (?)	27-023-90000	S17?, T11N, R43E	812'	1962	265
(Pershing County)						
Humboldt (Rye Patch)						
Phillips Petroleum Co.	Campbell E No: 1	27-027-90000	SE/4, S21, T31N, R33E	1853'	1977	325

Operator	Name	API No.	Location	Depth	Compl. Date	max. temp. (°F)
(Washoe County)						
Steamboat Hot Springs						
Nevada Thermal Power Co.	Steamboat No. 1	27-031-90000	NW/4, NE/4, S28, T18N, R20E	1830'	1954	
Nevada Thermal Power Co.	Steamboat No. 2	27-031-90001	SE/4, SW/4, S28, T18N, R20E	964'	1959	
Nevada Thermal Power Co.	Steamboat No. 3	27-031-90002	NW/4, NE/4, S32, T18N, R20E	1263'	1960?	
Nevada Thermal Power Co.	Steamboat No. 4	27-031-90003	NE/4, NW/4, S32, T18N, R20E	520'?	1960	367
Nevada Thermal Power Co.	Steamboat No. 5	27-031-90004	NW/4, NW/4, S32, T18N, R20E	826'	1961	347
Nevada Thermal Power Co.	Steamboat No. 6	27-031-90005	NW/4, NW/4, S32, T18N, R20E	716'	1961	354
The Needles (Pyramid Lake)						
Western Geothermal Inc.	Needles No. 1	27-031-90006	NW/4, SW/4, SW/4, S6, T26N, R21E	5888'	1964	~ 240
Western Geothermal Inc.	Needles No. 2 (?)	27-031-90007	C, W/2, NE/4, S12, T26N, R20E	4000'±	1962	
Western Geothermal Inc.	Needles No. 3 (?)	27-031-90008	NW/4, SW/4, SW/4, S6, T26N, R21E	?	1964	
Bird's Hot Springs (Fly Ranch)						
Western Geothermal Inc.	Fly Ranch No. 1 (?)	27-031-90009	SW/4, NE/4, SE/4, S2, T34N, R23E	1000'+	1964	
Granite Ranch						
Western Geothermal Inc.	(?) Granite Ereek Ranch 1	27-031-90010	S35?, T34N, R23E	800'	1965?	
San Emidio Desert						
Chevron Oil Co.	Cosmos No. 1-8	27-031-90011	SE/4, S8, T29N, R23E	4013'	1975	
(White Pine County)						
Monte Neva Hot Springs						
Magnum Power Co.	Monte Neva No. 1 (?)	27-033-90000	S24?, T21N, R63E	402'	1965	

## Elko District - Nevada

	Company Name	NOI Period of Exploration	Notice of Completion	Location	Type of Work	D/O #
4/1/74	Chevron Oil	5/1/74-12/1/74		Whirlwind Valley W. end Crescent Valley	Resistivity Survey	25
6/20/74	U.S. Geol. Survey	7/1/74-9/1/74		Delcer Buttes, Lone Mtn. Crescent Valley E. & W.	Temperature grad.	35
8/3/74	U.S. Geol. Survey	8/1/74-8/1/76		White Mtns	Temperature grad.	38
7/24/74	Chevron Oil	8/1/74-12/15/74	4/23/75	Crescent Valley	10 Temp. gr. downhole	36
11/14/74	Union Oil	12/1/74-2/20/75		Ruby Valley	2 temp. grad.	G-1
1/31/75	U.S. Geol. Survey	3/1/75-12/1/75		Swalo Mtn	Temp. grad.	G-2
3/6/75	Chevron Oil Co.		10/6/75	Crescent Valley	Gravity	G-3
8/11/75	Phillips		9/4/75	Crescent Valley Pine Valley	11 temp. grad. hole	G-4
9/11/75	U.S. Geol. Survey	9/10/75		Elko KGRA	Electromag-Gravity Survey	G-5
11/17/75	So. Union Oil	12/1/75-10/31/76			Hot Sulphur Springs Hot Springs N. of Wells	G-6
11/26/75						
4/12/75	Chevron Oil		1/23/76	Rease River Sheep Creek Range	Resistivity Survey	27000-3
12/5/75	Chevron Oil	12/1/75	1/23/76	Crescent Valley	Surface Resistivity Survey	G-7
12/23/75	Phillips Petroleum	12/23/75	12/8/76	Sheep Creek Range	Temperature Grad.	G-8
3/30/76	Chevron Oil	3/30/76	9/23/76	Crescent Valley	Surface Resistivity Survey	G-9
4/22/76	Chevron Oil	4/22/76	9/23/76	Crescent Valley	Magneto-tellurie	G-10
6/17/76	U.S. Geol. Survey	6/17/76		Ruby Valley	Magneto-tellurie	T3-01
8/20/76	Chevron Oil	9/1/76-9/1/77	8/4/77	Battle Mtn.	Temperature Grad.	T0-02
8/26/76	Dow Chemical	9/1/75-9/1/77	1/12/77	Crescent Valley Whirlwind Valley	Resistivity Survey	T0-03
4/24/76	Union Oil	4/1/76-10/31/77		Ruby Valley	Temperature Grad.	
9/23/76	U.S. Geol. Survey	10/13/76		Whirlwind Rosewood Area	Temperature Grad.	
10/18/76	Chevron	10/13/76-10/1/77	8/4/77	Crescent Valley Fault & Vicinity	Temperature Grad.	G.N.V.010 77-1
11/22/76	Chevron	11/22/76-11/1/77	2/4/77	Hot Springs Point	Temperature Grad.	77-02
12/6/77	Phillips	12/6/76-12/1/77		Rock Springs Antelope Creek	Temperature	77-03
4/4/77	U.S. Geol. Survey	6/1/77-6/1/78		Elko District	Temperature Grad.	77-04

## Winnemucca District - Nevada

	Company Name	NOI Period of Exploration	Notice of Completion	Location	Type of Work	D/O #
1	Phillips	2/15/74-7/15/74	11/22/74	T 41-45 N 30-32 C	Temp. Grad. Hole	N2-4-74
2	Phillips	4/1/74-3/30/74	10/3/74	Pinto Mountains	Temp. Grad. Hole	N2-5-74
3	Phillips	2/1/74-3/15/74	5/22/74	Gradys Hot Spring	Seismic Survey Temp. Grad. Hole	112-6-74
4	Phillips	3/1/74-7/1/74	7/24/74	San Emidio Desert	Temp. Grad. Hole	N2-7-74
5	Chevron	4/22/74-8/1/74	11/21/74	Northern Dixie Valley	Electric Resistivity Survey	N2-3-74
6	(AEC) ERDA	7/1/74-12/31/76		Buffalo Valley	Geophysical Survey	N2-14-74
7	(AEC) ERDA	4/15/74-12/31/76		Kyle Hot Springs	Geophysical Survey	N2-15-74
8	(AEC) ERDA	4/15/74-12/31/76		Leach Hot Springs (Gerlach Area)	Geophysical Survey	N2-16-74
9	Chevron	6/1/74-12/1/74	11/21/74	Alkali Flat	Electric Resistivity Survey	N2-18-74
10	Chevron	5/1/74-12/1/74	11/21/74	Leach Area	Electric Resistivity Survey Gravity & Survey	N2-19-74
11	Al-Aquitane	5/1/74-7/1/74	6/17/74	San Emidio Desert		N2-20-74
12	U.S. Geol. Survey	8/1/74-8/1/76		Blue Wing Planning Unit	Temp. Grad. Hole	N2-22-74
13	Phillips	7/15/74-10/15/75	10/16/75	Rye Patch Northern Buena Vista Valley	Temp. Grad. Hole	N2-28-74
14	Chevron	9/1/74-2/15/75	4/14/75	San Emidio Desert	Temp. Grad. Hole	N2-29-74
15	Union	10/7/74-12/4/74	1/20/75	Rye Patch	Thermal Probe hole	N2-35-74
16	U.S.G.S.	7/3/74-7/8/76		T38N, R33E T39N, R38E	Temperature Monitoring well	SLUP N2-22-74
17	U.S.G.S.	3/15/74-3/15/75	7/3/74	Denio	Temperature Monitoring well	SLUP N2-1-74
18	U.S.G.S.	12/13/73-12/12/74		Hills Denio & Slumbering	Temperature Monitoring well	SLUP N2-27-75
19	Colo. School Mines	5/74-12/31/75	2/29/76	Gerlach Area	Geophysical Survey and Test Hole	N2-6-75
20	Sun Oil Co.	1/75-6/75	8/21/75	Northern Dixie Valley	Temp. Grad. Hole	N2-7-75
21	Sun Oil Co.	1/75-6/75	8/21/75	Northern Dixie Valley	Temp. Grad. Hole	N2-7-75
22	Phillips	3/7/75-11/1/75	10/6/75	Gerlach Area	Temp. Grad. Hole	N2-12-75
23	Chevron	4/1/75-12/31/75	5/27/75	Leach Hot Springs	Electric Resistivity Survey	N2-13-75
24	Sun Oil Co.	4/20/75-6/1/75	6/3/75	Northern Smoke Creek Desert	Electric Resistivity Gravity Survey	N2-15-75
25	Chevron	5/1/75-12/31/75	3/26/76	San Emidio Desert Northern	Gravity Survey	N2-16-75
26	S. Union Prod.	5/15/75-7/15/76	12/9/76	Northern Black Peak Desert	Research Evaluation	N2-17-75
27	S. Union Prod.	5/15/75-7/15/75	12/9/76	Northern Black Peak Desert	Research Evaluation	N2-18-75
28	S. Union Prod.	5/17/75-5/17/77		Brady Area	Temp. Grad. Hole	N2-19-75
29	Chevron Oil	5/23/75-12/31/75	10/6/75	Gerlach-	Resistivity Survey	N2-22-75
30	Chevron Oil	7/1/75-12/31/85	3/26/76	Gerlach-	Gravity Survey	N2-23-75

## Winnemucca District - Nevada (Continued)

	Company Name	NOI Period of Exploration	Notice of Completion	Location	Type of Work	D/O #
31	U.S.Geol. Survey	6/9/75-6/9/77		Leach Hot Springs	Shallow Test Holes	N2-24-75
32	Phillips	6/75-11/75	10/16/75	Pumpnickel Valley Hot Springs Ranch	Temp. Grad. Hole	N2-25-75
33	Hunt Oil	8/75-10/75	11/26/75	Black Peak Desert	Electric Resistivity Survey	N2-3-76
34	Union Oil (La)	9/15/75-10/31/75	11/75	Black Peak Desert	Thermal Probe Holes	N2-5-76
35	Sun Oil (Dallas)	9/1/75-1/1/76	2/9/76	Black Peak Desert	Electric Resistivity & Survey	N2-6-76
36	U.S.Geol. Survey	9/23/75-10/20/75	11/7/75	San Emidio Desert	Audio-magneto & Tellurie Survey	N2-10-76
37	S. Union Prod.	11/18/75-10/31/76	10/27/76	Pumpnickel, Jersey & Buffalo Valleys	Surveys	N2-13-76
38	S. Union Prod	-10/31/76	10/27/76	Desert Areas Gerlach - Black Rock	Surveys	N2-14-76
39	Phillips	3/1/76-3/1/77	3/11/77	Rye Patch	Cancelled	N2-17-76
40	Chevron	3/19/76-9/15/76	1/27/77	Leach Hot Springs	Temp. Grad. Hole	N2-18-76
41	Union Oil	7/19/76-9/30/76	11/22/76	Sulphur Area	Thermal Probe Hole	N2-20-76
42	Colorado Sch. Mines	3/30/76-12/31/76		Gerlach-Hualapai	Surface Survey & Mapping	N2-22-76
43	Chevron Oil Co.	6/1/76-9/30/76	6/76	SAN Emidio Desert	Electric Resistivity Survey	N2-24-76
44	Chevron Oil Co.	7/1/76-10/30/76	9/24/76	San Emidio Desert	Seismic Resistivity Survey	N2-27-76
45	U.S.Geol. Survey	6/27/76-7/31/76	11/11/76	Pinto KGRA	Audio Magneto Tellurie Survey	N2-28-76
46	U.S. Geo. Survey	6/27/76-7/31/76	11/11/76	Rye Patch KGRA	Audio Magneto Tellurie Survey	N2-28-76
47	Chevron	9/2/76-12/15/76		Kyle Hot Springs	Temp. Grad. Hole	N2-30-76
48	Hunt Energy			Sulpherania	Temp. Grad. Hole	N2-31-76
49	U.S.Geol. Survey	8/4/76-8/8/76	11/11/76	Pinto KGRA	Gravity Survey	N2-32-76
50	Sunoco	9/17/76-5/17/77		Granite Creek Gerlach	Heat Flow	N2-34-76
51	Sunoco	11/15/76-1/31/77		Gerlach	Magneto Tellurie Soundings	N2-2-77
52	So. Union Prod. Co.	12/6/76-12/1/77		Leach & Kyle Hot Springs	Geophysical Surveys	N2-4-77
53	So. Union Prod. Co.	1/3/77-1/1/78		Jersey Dixie Valley	Geophysical Surveys	N2-6-77
54	So. Union Prod. Co.	1/3/77-1/1/78		Pumpnickel Buffalo Valley	Geophysical Surveys	N2-7-77
55	So. Union Prod. Co.	1/3/77-1/1/78		Gerlach Empire	Geophysical Surveys	N2-8-77
56	Phillips	3/20/77-3/20/78	1/10/77	San Emidio Desert	Temp. Grad. Hole	N2-15-77
57	Chevron	4/1/77-10/1/77		Kyle Hot Springs Area	Temp. Grad. Hole	N2-1-677
58	U.S.Geol. Survey	4/20/77-4/30/77		Bartazar Area	Surface Geophysical Survey	N2-17-77
59	Chevron	5/1/77-11/1/77	7/15/77	San Emidio Desert	Temp. Grad. Hole	N2-17-77
60	Chevron	7/1/77-4/28/78		Grass Valley (Packing Co.)	Temp. Grad. Hole	N2-19-77



## Winnemucca District - Nevada (Continued)

	Company Name	NOI Period of Exploration	Notice of Completion	Location	Type of Work	D/O #
61	U.S. Geol. Survey	7/1/77-7/1/78		Thacher Pass, Brady H. Spring	Temp. Grad. Hole	N2-20-77
62	U.S. Geol. Survey Earthquake Studies	4/18/77		Brian Meadow, Battle Creek Black Rock Desert Dyke Hot Springs	One Seismic Hole	N2-21-77
63	Earth Power	4/13/77-9/30/78		McDermitt Area	Temp. Grad. Hole	N2-22-77
64	Earth Power	4/18/77-9/30/78		Zenio Area	Temp. Grad. Hole	N2-23-77
65	Hydro-Search	5/77-8/77		Brady Hot Springs	Temp. Grad. Hole	N2-24-77
66	Earth Power	4/18/77-9/30/77		McGee Mtn (Humboldt Co.)	Temp. Grad. Hole	N2-27-77
67	Chevron Geophys. Co.	7/1/77-11/30/77		San Emidio Area	High Resolution Seismic Survey	N2-30-77
68	U.S. Geol. Survey (Water Resources)	7/1/77-7/1/78		Grass Valley Fershing Co.	One 4' Diam. Hole	N2-31-77
69	Republic Geoth. Inc.	7/17/77		Jersey Valley	Temp. Grad. Hole	N2-34-77
70	U.S. Geol. Survey (Geothermal Studies)	7/15/77-7/17/78				
71	U.S. Geol. Survey (Water Resources)	7/24/77-7/24/78		Leach Hot Springs	Shallow Heat Hole	N2-36-77
72	Encco, Inc. Seismic Explo. Co.	8/77-9/77		Gerlach Area	Seismic Emission Study	N2-37-77
73	Electrocynes Survey Service	6/30/77-8/15/77		Northeast of Lovelock Area	Electric Resistivity Seismic Study	N2-39-77
74	Earth Power	8/2/77-2/1/78		McGee Mts.	Temp. Grad. Holes 15 ea	N2-40-77
75	Earth Power	8/2/77-2/1/78		Pueblo Mt. Area	Temp. Grad. Holes	N2-41-77
76	Union Oil Geothermal Div.)	8/20/77-8/1/78		Rye Patch Area	Audio-Magneto Telluric & dipole-dipole R.S.	N2-42-77
78	U.S. Geo. Survey	8/16/77-9/2/77		Grass Valley Jungo Area	Heat Flow Study	N2-43-77
79	Phillips Petro.			Adobe Flat-Granite Springs Valley	7 ea, 300 temp. Grad. Holes	N2-45-77
80	United Geophysical			San Emidio Desert	Seismic Survey	N2-47-77

## Carson City District - Nevada

	Company Name	NOI Period of Exploration	Notice of Completion	Location	Type of Work	D/O #
1	Phillips Petro.		7/1/74	T16N, P.30E	10 Temp. Grad. Holes	27-030-01
2	Chevron Oil		11/15/75	T19-20N, R.25-26E	Resistivity Survey	27-030-02
3.	Chevron Oil		8/8/74	T10-11N, R25-26E	Resistivity Survey	27-030-03
4	Al-Aquitane		6/28/74	T13N, R33, 34E T12N, §34, 35E	Gravity AMT	27-030-04
5	Al-Aquitane		6/28/74	T16N, R22#	Gravity AMT	27-030-05
6	Al-Aquitane		6/28/74	T21N, R33E	Gravity AMT	27-020-06
7	U.S.G.S. Thomas H. Moses			T23N, R18E	2 Temp. Grad. Holes	27-030-07
8	Sun Oil Col		6/30/75	T23-25N. R35-33#	15 Temp. Grad. Holes	27-030-08
9	Phillips Petro.		11/1/75	T16-25N, R27-33E	5 Temp. Grad. Holes	27-030-09
10	(USGS) Geotronics Corp		4/17/75	Stillwater Soda Lake	Magneto Telluric Survey	27-030-09
11	Phillips Petrol.		11/1/75	T19N, R27-28E	2 Temp. Grad. Holes	27-030-12
12	Westinghouse (USGS)		5/15/75	(KGRA) Stillwater Soda Lake	Magneto Telluric Survey	27-030-13
13	Union Oil Co.		6/11/75	T17-18N, R29-30E	10 Temp. Grad. Holes	27-030-14
14	Geonomics		6/15/75	T14-17N, R33-35E	Resistivity Survey	27-030-15
15	U.S.G.S., Denver			(KGRA) Steamboat-Wabuska	Gravity Survey	NV-030-16
16	Hydro Search, Inc.			Wabuska (KGRA)	Gravity Resistivity Survey	NV-030-17
17	Hydrosearch, Inc.		9/76	Steamboat (KGRA)	Gravity Resistivity Survey	NV-030-18
18	Chevron Oil		4/30/76	North Dixie Valley	5 Temp. Grad. Holes	NV-030-20
19	Hydrosearch, Inc.			Fallon Area	Gravity Resistivity Survey	NV-030-21
20	Hunt Oil		3/19/76	Salt Wells Area	Resistivity Survey	NV-030-22
21	USGS, Denver		2/5/76	Dixie Valley	Resistivity Survey	NV-030-23
22	Phillips Oetrol		7/22/76	Steamboat	2 Temp. Grad. Holes	NV-030-24
23	Chevron		5/31/76	Wilson Hot Springs	2 Temp. Grad. Holes	NV-030-25
24	Geonomics		6/15/76	Carson Sink	Resistivity Survey	NV-030-26
25	Republic Geothermal (Hunt Energy Co.)			Gabbs Valley	Temp. Grad. Hole	NV-030-27
26	Geothermal Services (Hunt Energy Co.)			T17-20N, R20-21E	17 Temp. Grad. Holes	NV-030-28
27	Geothermal Services			T22-24N, R31-33E	30 Temp. Grad. Holes	NV-030-29
28	Dow Chemical (Hunt Energy)		12/20/76	T22-24N, R35-37E	14 Temp. Grad. Holes	NV-030-30
29	Geothermal Services Sun Oil Co.			T15-19N, R31-34E	43 Temp. Grad. Holes	NV-030-31
30	Geothermal Services			Dixie Valley	2 Temp. Grad. Holes	NV-030-32

## Carson City District - Nevada (Continued)

	Company Name	NOI Period of Exploration	Notice of Completion	Location	Type of Work	D/O #
31	Geonomics, Inc.		1/17/77	Wilson Hot Springs	22 Temp. Grad. Holes	NV-030-33
32	Dow Chemical			T22-23N, R35-36 E	Withdrawn	NV-030-34
33	Al-Aquitane Ltd. (Sun Oil)		3/23/77	Gabbs Valley T24N, R36-37E)	5 Temp. Grad. Holes	NV-030-35
34	Sunoco Energy Dev. Co			Dixie Valley	Magneto-telluric	NV-030-36
35	Photo Gravity			Wilson Hot Springs	Gravity Survey	NV-030-37
36	Anadarko Prod. Co.		3/6/77	Salt Wells Basin	Gravity Survey	NV-030-38
37	Anadarko Prod. Co.			Salt Wells Basin	Resistivity Survey	NV-030-39
38	Sunoco Energy Dev. Co		6/1/77	Dixie Valley	Passive Seismic Emission Study	NV-030-41
39	Chevron, USA, Inc. (USGS-Moses)		6/20/77	Wilson Hot Springs	6 Shallow Temp. Grad. Holes	NV-030-42
40	Western Geophysical			Clan Alpine Mts.	1 Temp. Grad. Hole	NV-030-43
41	Chevron USA, Inc.			Soda Lakes	Seismic Survey	NV-030-44
42	Republic Geothermal			Dixie Valley (KGRA)	13 Temp. Grad Holes	NV-030-45
43	USGS (Hoover)		6/29/77	Salt Wells Basin	Gravity AMT Survey	NV-030-46
44	Al-Aquitane Explo Ltd			Gabbs Valley	16 Temp. Grad. Holes	NV-030-47
45	Al-Aquitane Explo.Ltd			Gabbs Valley	Gravity Magneto Magneto telluric Sur	NV-030-47
	Amex Exploration			Augusta Mts.	15-500 ft. shallow Temp. Grad. Holes	NV-030-51





Battle Mountain District - Nevada

	Company Name	NOI Period of Exploration	Notice of Completion	Location	Type of Work	D/O #
1	Chevron Oil Co.	2/6/75		T31N, R47E		27-060-01
2	Chevron Oil	3/23/75		T33-34N, R45E		27-160-02
3	S. Union Prod. Co.	11/19/75		T32-34N, R 40-41E		N2-13-76
4	Phillips Petrol. Co.	12/17/75-12/17/76	12/6/75	T31N, R45E T32N, R54E		27-060-05
5	Union Oil	3/23/76-3/1/77	11/25/76	T16-17N, R39E T17N, R40E		NV-060-09
6	Chevron Oil	4/76-10/77		T33N, R45-46E		G-NV-010-
7	Chevron Oil	4/26/76-4/1/77	9/20/76	T29-31N, R47-48E		NV-060-11
8	Chevron Oil	5/12/76-5/1/77	9/20/76	T30-31N, R47-48E		NV-060-12
9	S. Union Prod.	8/23/75-8/1/77		T31N, R47#		NV-060-15
10	So. Union Prod.	8/23/76-8/1/77		T31N, R47E		NV-060-16
11	U.S. Geol. Survey	4/4/77-		T15, 25N, R45E T19N, R49E T24N, R51E	Shallow Temp. Grad. Hole	NV-060-25
12	Lanton Survey Co.			Warm Springs		NV-060-77

APPENDIX F

TEMPERATURE GRADIENT HOLES

Per a 1976-1977 Status Report for the Reno Geothermal District of the Conservation Division of USGS, the following data summarizes the planned and completed activity in the Area during this period.

<u>Depth of Wells</u>	<u>No. of Wells</u>
100'	51
300'	3
490'	44
500'	37
1000'	3
1500'	2
2000'	2
3000'	7
5500'	7
8000'	6
9000'	5

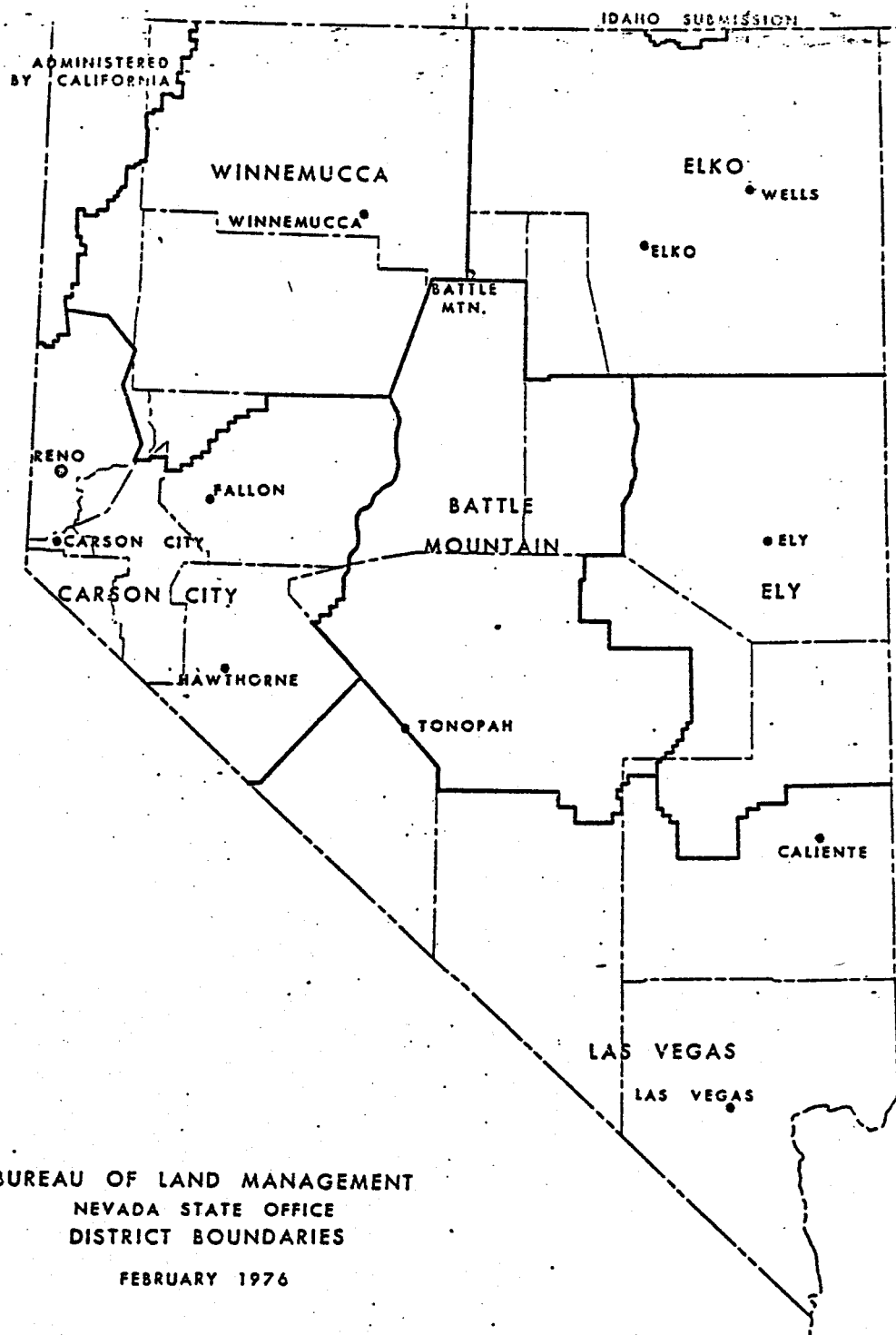
APPENDIX G

EAR'S FROM BLM

1. BAKER
2. BUFFALO HILLS
3. CALIENTE-VIRGIN VALLEY PLANNING UNIT
4. CHERRY CREEK RESOURCE AREA
5. ELKO
6. ESMERALDA
7. EUREKA
8. FAIRVIEW
9. JAKES VALLEY-SUNNYSIDE
10. FORT CHURCHILL-CLAN ALPINE AREA
11. PINE-NUT WALKER AREA
12. PYRAMID AREA
13. STATELINE PLANNING AREA
14. TONOPAH RESOURCE AREA
15. WINNEMUCCA
16. BATTLE MOUNTAIN
17. SHOSHONE RESOURCE AREA
18. MINA AREA
19. LITTLE SMOKY VALLEY
20. SONOMA-GERLACH-BUFFALO HILLS PLANNING UNIT



APPENDIX H



BUREAU OF LAND MANAGEMENT  
NEVADA STATE OFFICE  
DISTRICT BOUNDARIES

FEBRUARY 1976

APPENDIX I

LAND USE PLANNING AND MANAGEMENT UNITS

01-ELKO DISTRICT

48-Elko Resource Area  
 Tuscarora Planning Area  
 0101-Tuscarora Planning Unit  
 0102-North Fork PU  
 Humboldt PA  
 0105-Buckhorn PU

68-Wells Resource Area  
 Wells PA  
 0103-Contact PU  
 0104-Currie PU

02-WINNEMUCCA DISTRICT

48-Paradise-Denio Resource Area  
 Paradise PA  
 0201-Paradise PU  
 Denio PA  
 0202-Denio PU

68-Sonoma-Gerlach Resource Area  
 Sonoma-Gerlach PA  
 0203-Buffalo Hills PU  
 0204-Blue Wing PU  
 0205-Sonoma PU

03-CARSON CITY DISTRICT

48-Lahontan Resource Area  
 Clan Alpine-Ft. Churchill PA  
 0301-Clan Alpine PU  
 0302-Fort Churchill PU  
 Pyramid-Long Valley PA  
 0306-Pyramid PU  
 0321-Long Valley PU\*

58-Walker Resource Area  
 Walker-Mina PA  
 0303-Walker PU  
 0304-Mina PU  
 Pine Nut-Markleeville PA  
 0305-Pine Nut PU  
 0322-Markleeville PU\*

04-ELY DISTRICT

48-Schell Resource Area  
 Moriah PA  
 0401-Moriah PU  
 Pony Springs PA  
 0410-White River PU  
 0411-Lake Valley PU  
 0412-Wilson Creek PU

58-Egan Resource Area  
 Cherry Creek PA  
 0404-Stop Toe PU  
 0405-Butte PU  
 0406-Newark PU  
 Currant PA  
 0407-Duckwater PU  
 0408-Preston Lund PU  
 0409-Horse and Cattle Camp PU

05-LAS VEGAS DISTRICT

48-Caliente-Virgin Valley Resource Area  
 Caliente PA  
 0501-Caliente PU  
 Virgin Valley PA  
 0502-Virgin Valley PU

68-Stateline-Esmeralda Resource Area  
 Esmeralda PA  
 0503-Esmeralda PU  
 Stateline PA  
 0504-Stateline PU  
 Defense & Test PA  
 0505-Mustang Range PU  
 0506-Withdrawal PU

06-BATTLE MOUNTAIN DISTRICT

48-Shoshone-Eureka Resource Area  
 Shoshone PA  
 0601-Cortez PU  
 0602-Mount Airy PU  
 Eureka PA  
 0603-Pony Express PU  
 0604-Devil's Gate PU

68-Tonopah Resource Area  
 Tonopah PA  
 0605-Manhattan PU  
 0606-Tybo PU  
 0607-Crater PU

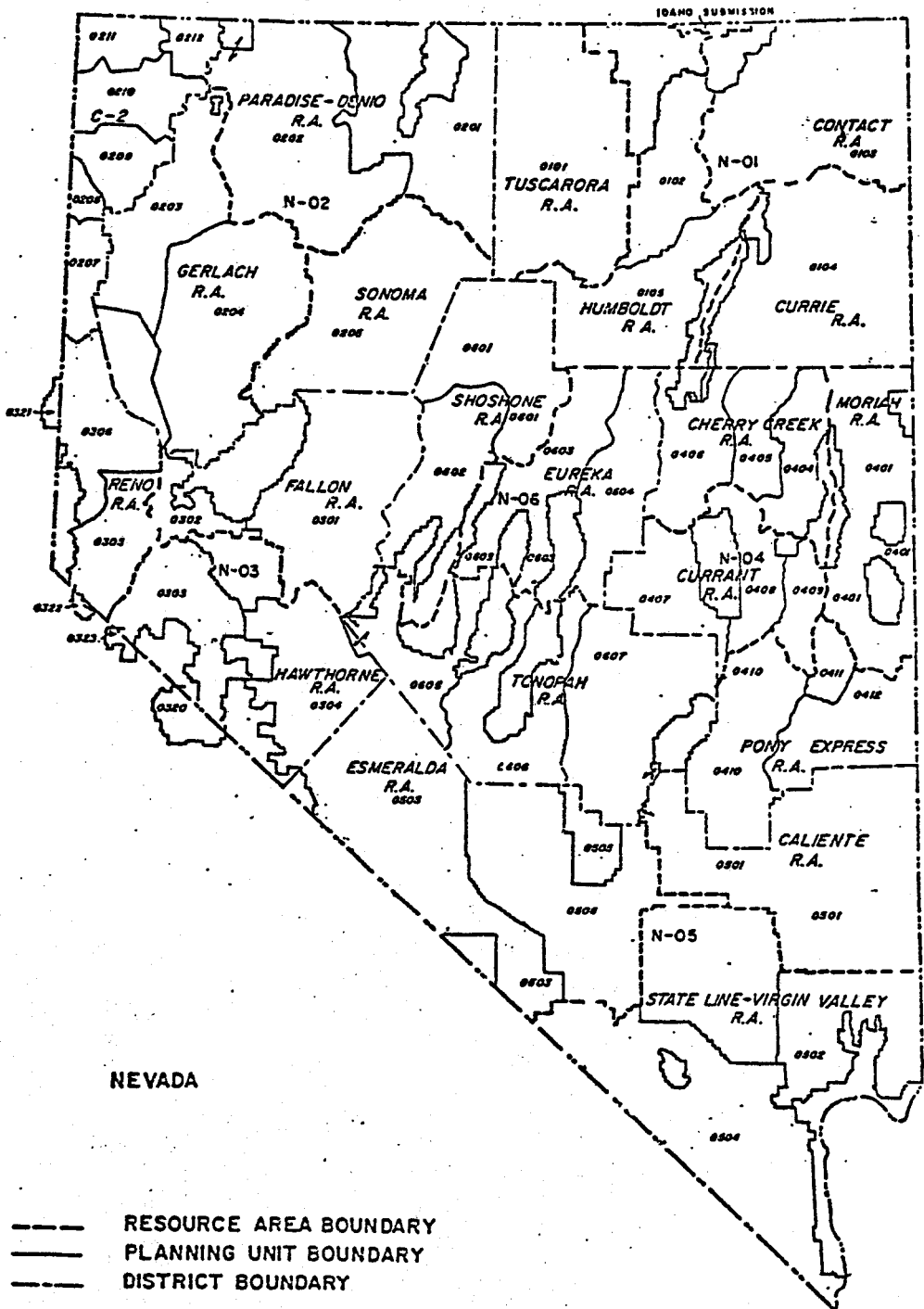
NEVADA BLM SUMMARY

District Offices - 6  
 Resource Areas - 12  
 Planning Areas - 22  
 Planning Units - 41

\* Located in California  
 Preface digits are ADP identification codes

APPENDIX J

NEVADA MAP OF RESOURCE AREA, PLANNING UNIT,  
AND DISTRICT BOUNDARIES



Revised June 1972

APPENDIX K

COMPONENTS OF THE ENVIRONMENTS FOR EAR STIPULATIONS

GROUP I - Living Components

1. Wildlife Habitat
2. Sage Grouse-strutting, brooding and nesting sites.  
Blue Grouse-associated with White Fir areas.
3. Wildhorse and Burro Habitat
4. Bighorn Sheep Habitat
5. Deer Habitat  
Mule Deer
6. Elk Habitat  
Pronghorn
8. Wildlife Management Areas  
Alkali Lake
9. Birds of Prey  
Prairie Falcon  
Peregrine Falcon  
Bald Eagle  
Golden Eagle  
Raptors
10. Life Water  
Waterfowl Habitat  
Wildlife Conservation & protection of water (surface) for various wildlife uses.  
Water resources (for wildlife and fish)
11. Fish Habitat  
Pahrump Killifish  
Ash Meadows Pup Fish  
Desert Dace  
Cutthroat Trout (Lahontan)
12. Mourning Dove

GROUP II - Ecological and Cultural Components

21. Archaeological Sites

22. Historic Places

(Those places NOW LISTED with the National Register of Historic Places).

23. Historic Places

(Those places which are QUALIFIED FOR, PROPOSED or, NOMINATED to the National Register of Historic Places.

24. Natural Areas (Ecological)

Thermal Springs

Geologic Areas

Pinyon-Juniper Woodlands

Botanical Areas

Joshua Tree Forest (Paiute Valley)

Swamp Cedar

Bristlecone Pine

Potosi Barrel Cactus

Cottonwood Cholla

Desert View Environment Area

Ecological Values

25. Scenic Areas

26. Antiquities and Objects of Historic Value

Cultural Resources

Historic Sites

Trails (Historic trade and Wagon Train Routes, Pony Express, Etc.)

27. Indian Pinyon-Nut Gathering Stipulation

GROUP III - Human Values

31. Recreation Areas

Hiking  
Picnicking  
ORV  
Hunting

Water Sports  
Administration Sites  
Water Resources-for recreation

32. Wilderness Areas (Existing)

33. Wilderness Areas (Proposed)

34. Primitive Areas (Proposed)

35. Roadless Areas (Proposed and Inventoried)

36. State Parks (Proposed)

37. Multiple Use Classification

38. National Forest

Watershed and Fire Rehabilitation  
Research Areas  
Recreation Areas  
Lake Tahoe Basin

GROUP IV - Non-Living Components

- 41. Bureau of Reclamation Withdrawls  
Irrigation and Dam Projects
- 42.
- 43. Unstable/Erodable Soils (recommended by USFS and BLM)  
Ecology and terrain such as to be extremely  
sensitive to distrubance
- 44. Military  
Ordinance Areas
- 45. Rights-Of-Way Areas
- 46. Federally Controlled or Developed Water Projects  
(Other than those listed under the Bur. of Reclamation)
- 47. Snow Survey Transects
- 48. Critical Watershed Areas  
Municipal

APPENDIX L

EXPLANATION

LANDS EXCLUDED FROM LEASING

RED

No Leasing

YELLOW

No Leasing- Pending  
(No leasing permitted  
until a final land use  
decision is made follow-  
ing additional environ-  
mental studies.)

LEASING - WITH RESTRICTIONS

BLUE

Non- Critical

ORANGE

Critical

The two divisions under this category are the Non-Critical and Critical. The non-critical areas are those upon which entry will be allowed after permission is obtained from the district offices. These areas are subject to the stipulations contained within the Geothermal Resource Lease ( Sections 14 and 18) and additional restrictions.

Critical areas are those areas with stipulations of CRITICAL in their explanations, or NO SURFACE ENTRY, and others explained in the criteria used for the evaluation of EAR data. Areas with the stipulations of SITE-BY-SITE decisions may also be included. These additional stipulations are also attached to the Geothermal Resource Lease Stipulations (Sections 14 and 18).



## APPENDIX M

Regional Planning Workshop  
Salt Lake City, Utah  
April 26, 1978

### SUMMARY NEVADA OPERATIONS RESEARCH SOUTHWEST REGIONAL GEOTHERMAL PROJECT

G. Martin Booth III  
Nevada Team Leader

By the end of the first year of the Southwest Regional Geothermal Project, the Nevada State Team will have defined over 300 potential geothermal sites. Because of the multitude of sites and data, scenarios for this fiscal year are being completed for 26 "areas" which will include all the specific sites. It is not improbable that fully one-third of the sites will prove to be of high to intermediate in temperature (i.e.  $>150^{\circ}\text{C}$  and  $90^{\circ} - 150^{\circ}\text{C}$ ). Low temperature ( $<90^{\circ}\text{C}$ ) sites are also prominent, not only in number, but also in their distribution - each of our 17 counties has several such sites.

Fully 86 percent of the land in Nevada is Federally administered. Less than 2 percent is State land. The remaining 12 percent is private land, one-half of which is owned by the Southern Pacific Railroad.

Essentially all the leasing in the State is on Natural Resource Lands (Public Domain) which is under the jurisdiction of the BLM. Since leasing on Federal Lands was initiated in 1974, there have been millions of acres in geothermal lease applications by more than 150 companies and individuals.

As of February, 1978, there were 881,971 acres under lease with BLM. Fully 152,662 acres (or 17%) of this total, were within KGRAs; and the balance of 729,309 acres (or 83%), were non-KGRA leases.

All of the checkerboarded railroad lands are presently being evaluated by Phillips Petroleum Co., under an agreement with Southern Pacific. A significant percentage of the remaining private land in the northern and western sections of the State is held under lease by a number of companies.

The level of activity in Nevada is very high. There are 30 companies and groups, each of which hold 10,000-20,000 acres in Federal leases. DGE/DOE supported projects are now supplying and will provide for increasing momentum to exploration and development projects by means of several of its programs.

The Nevada Operations Research group is currently establishing aggressive, realistic scenarios, with emphasis on those which will come on line by the year 2020. To ensure that the site specific scenarios are truly usable to planners, the team is concerned not only with the technical data normally developed for resource assessment, but also the social, economic, institutional, and political elements. The Nevada Team has developed techniques for graphic representation of a vast amount of data and information which is available, and which must be considered in constructing the scenarios. To date three major categories, graphically portrayed on 1:250,000 scale AMS maps, are: (1) Environmental, (2) Exploration, and (3) Leasing. Many other important factors are being considered as well.

Nevada is experiencing a surge in population with an accompanying increase in energy demand. State planners concerned with energy, the environment, and other concerns connected with growth, will benefit extensively, and special studies elements of this Project. The results of the Operations Research studies will give the executive and legislative branches of the Nevada State government a means with which to plan and formulate policy in areas of land use planning, plant siting, inter- and intra-state energy coordination and cooperation, and other areas of concern.