GL00985

FOL

G E O T H E R M

Instructions for Reporters

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Prepared By

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What to do with completed forms

Make xerox copies of the filled-out forms. Keep the xerox copies in your possession for reference and backup and send the originals to:

James R. Swanson
U.S. Geological Survey
National Center M.S. 920
Reston, Virginia 22092
(703) 860-6737

Blank forms can be obtained from the above source.

How to use this manual

This manual is to be used as a reference for completing GEOTHERM coding forms. The reporter is encouraged to read the section entitled "General Instructions" (p. 6-8).

GEOTHERM includes three kinds of records and therefore uses three reporting forms. Instructions for all three forms are contained in this manual even though a reporter may be interested in only one of the three.

Information in this manual can be located in several ways.

1) The instructions for each form are color coded.

   Blue - A - Geothermal field
   Yellow - B - Chemical Analysis
   Green - C - Geothermal Well

2) Each field (label) on the form can be located by referring to the index beginning on page 159.

3) Major headings on the forms can be located by referring to the Table of Contents.

4) Completed examples begin on page 121.

TABLE OF CONTENTS

INTRODUCTION

The geothermal resources computer file (GEOTHERM) consists of a set of records relating to the location, exploration, and evaluation of geothermal energy and resources. The file is an "attribute" or "properties" file (in contrast to a bibliographic file) and, as such, the basic record contains descriptive and numeric data on a set of variables that describe and characterize the various aspects of geothermal resources.

The volume of geothermal data makes it necessary to form a computerized file. The present design of the file has been based on the knowledge and desires of scientists who wish to use the file. This computer file provides many ways to access all or part of the data for reports or in formats for existing manipulative programs.

FILE DESCRIPTION

General organization (Revision 8)

In order to both accommodate and provide general and specific data, the file has been constructed into sections of logically related information. The three subtopics (sections) dealt with thus far are:

Section A - Geothermal Field or Area
Section B - Chemical Analysis
Section C - Geothermal Well/Drill hole

In most cases, information on all these sections will relate to a specific geothermal field. Additional sections can be added when needed.

Section A is specifically designed to give locality, description, developments, and performance of a geothermal field or area. It contains a very broad coverage that is subject to change with time. Records of this sort will be updated periodically.

Section B contains information on surface or well samples of a geothermal field. Space is provided for three types of analyses--water, condensate, and residual gas. One section is provided for cases in which gas and water are sampled in one collection.

Section C is designed to contain the locality and performance data from geothermal wells.

Each section is considered one record for the file. Thus, for each field (Section A) there may be many wells (Section C), and from each well there may be many samples (Section B). The information ranges from a broad description in Section A to specific data in Section B.

Technical notes

GEOTHERM is operating under the General Information Processing System (GIPSY), a storage and retrieval program developed at the University of Oklahoma. GIPSY is written in IBM assembly language and runs on the IBM 360-370 computers. The program, which operates in Batch, Timeshare, and Index modes, was designed to handle variable-length records and to provide the user with a means for making highly selective retrievals from the file. The GEOTHERM file is stored on disk devices connected with the U.S. Geological Survey's 370-155 computer at Reston, Virginia. Retrievals can be made in Batch or Timeshare modes, but storage and updating are done only in Batch mode.

The file definition in the GIPSY program consists of a series of "labels" which identify each field in the record. The labels, together with certain control and descriptive information, are stored in a separate file called the "dictionary." All the labels are of equal rank, i.e., there is no hierarchical structure. The records are stored in random order on disk.

The variable-field, variable-length record format provides great flexibility in the design of the file and ma efficient use of available disk storage. The program identifies a field only by its label. Therefore, the fields are independent of their position in the record and may be of variable length. These features allow us to interleaf the various section (subtopics) into a single master file, and at the same time to maintain the identity of the individual sections. We are also able to use the same fields (labels), where called for, on several reporting forms and to place fields in any order desired.

The efficient use of disk storage is accomplished by the fact that, in contrast to fixed-length organization, blank fields are not stored. Records are compressed because only those fields that contain data are actually recorded on disk. Additional storage efficiency is obtained by the spanned-record feature, which allows records to occupy part of one track and overflow to the next.

Reporting forms

The information items asked for are arranged into logical elements (called fields) on special reporting forms (source documents)--a separate reporting form for each section. Information filled out on these forms is key-punched and entered into the computer file. Each field on the reporting forms contains a field name, a label, a space for information, and set of delimiters (< >) which mark the beginning and end of the field. The label identifies the field to the user. Thus, the label A30 is equivalent to the field name "Record Type." The information to be entered by the reporter consists of descriptive text, numeric fields, and certain codes. Fields containing textual material are unformatted and may be of any length, to a maximum of 32,000 characters. Other fields on the form require data to be entered in rigid fixed-length format. These are primarily fields that contain numbers and that will be used in computations.

Previous revisions

The original design of the file included the eight following sections:

Section A - Geothermal Field/Area
Section B - Surface Sample Data
Section C - Geothermal Well/Drill hole
Section D - Steam (Vapor) Sample from Well
Section E - Water (Liquid) Sample from Well
Section F - Isotopic Data
Section G - Space and Process Heating
Section H - Binary System

Sections A and C are essentially unchanged. Sections B, D, E, and F have been put together into one section called Chemical Analysis, the present Section B. This one section can provide information for a complete analysis of samples from one collection event. However, information can still be retrieved from GEOTHERM in the original formats. For example, if the user was only interested in isotopic data, the records could be retrieved in that form.

Initial efforts to create this file will stress the geologic and chemical aspects of geothermal fields. Because Sections G and H are primarily engineering sections, they have been set aside for future considerations.

Editing and maintenance

All maintenance to GEOTHERM is done by the file supervisor, although the reporter is encouraged to notify him of any revisions that should be made. Maintenance includes adding (building), deletion, and changing of records.

Valid records are those that meet minimum requirements. All records must have reporter name, date, organization, and at least one reference for the data. Data evaluation is not the job of the file supervisor; it is the responsibility of the specialist who accesses the file. The minimum requirements make it possible to track down the data source for further evaluation.

All records are processed by a program that converts all numbers to standard units. For example, pressure will be expressed in kg/cm^2. Submitted numbers in other units will be converted, and both numbers will be retained in the file. This conversion procedure makes it possible to compare numbers and to make calculations involving the entire file.

GENERAL INSTRUCTIONS

The three types of records in the file are:

Section A - Geothermal Field/Area

This type record is designed to give locality, description, developments, and performance of a geothermal field. Locality information (especially latitude-longitude or some other grid system) and the name of the field are essential. The file already contains records on 290 fields/areas in the United States.

Section B - Chemical Analysis

The information in this section is derived from specific samples collected for water, condensate or gas analysis from surface sites or wells. The surface-sample source does not have to be a hot spring; it may include cold springs within the area. The requested chemical parameters require measured data rather than calculated data. Sample source and locality are required.

Section C - Geothermal Well/Drill hole.

This type of record is designed to contain locality and performance information for a geothermal well or drill hole. Locality information and a unique identifier are required information.

Other required information for all records include reporter name, organization, date of form completion, and references from which the information was collected. If the information came from unpublished files, then indicate the location of those files.

General format

Most information is free form (i.e., in the form of sentences or text. Each piece of information requested is associated with a label (A10, B10, etc.) and a set

of delimiters (< >) within which the information is entered. If there is not enough space, then the information can be continued on the back of the page.

Some information such as numeric fields require a set format.

For example:

Total Stored Heat F13<.....|.....> units

In such cases, the contents of the label will conform to certain rules which will be defined in the individual instruction.

Of course, if information is not available for a given field, then leave the field blank.

Reserved characters

Some characters should not be used by the reporter. These are listed below with their substitutions.

Symbol		Use
>	Greater than	GT
<	Less than	LT
°	Degree	DEG
½		½ or .5
¼		¼ or .25
'	Minute, feet	min , ft
"	Second, inches	sec , in

Numeric fields

All numeric fields associated with units will conform to the following rules:

1) All numbers must contain a decimal point even if there are no decimal places.

2) All numbers must be left justified (i.e., they must line up against the left margin of the field). Units must be entered beginning with the marked character space.

3) Exponents may be used but must follow the E-format used in data processing. A number in exponential form must also conform to the above rules.

See Appendix B for examples.

Units

The reporter is not required to use any particular units. A computer program will convert all numbers to a standard set of units. If conversion is necessary, then both numbers (the submitted number and the converted number) will be retained in the record.

Suggested abbreviations and standard units can be found on Appendices C and D at the end of the instructions.

SECTION A - GEOTHERMAL FIELD/AREA

Input form

This input form is designed for records on geothermal fields or areas. The information includes locality, description, developments, and performance of the geothermal field.

Geothermal Resources File (GEOTHERM)
Revision 8 (February 1976)

Section A: Geothermal Field-Area (H1)

Record Identification

Record No. A10 <_____>

Cross Index No. A20 <_____>

Revision A25 <__>

Record Type A30 < A >

Reporter

Name A50 <_____>

Date A60 <__/__> (Yr./Mo.)

Organization A70 <_____>

Geographic Locality

Name of Field-Area B10 <_____>

Users of Area B13 <_____>

Waring Figure (USGS) B14 <__>

Waring Number (USGS) B15 <_____>

Country Code (List A) B40 <__>

Country Name B50 <_____>

State/Province B60 <_____>

County B65 <_____>

Latitude B70 <___ D ___ M ___ S N/S>

Longitude B80 <___ D ___ M ___ S E/W>

Available Maps of Area B81 <_____>

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Township, Range, Section, 1/4, 1/4

B95 <___> Township B105 <___> Range B115 <_____ Section _____ 1/4 _____ 1/4 _____>

Base & Meridian B125 <_____>

Other Locality Information B83 <_____>

General Description

Size of Surface Expression C10 <_____ units _____>

Elevation B140 <_____ units _____>

Resource Catagory C15 <__>

Development Status C20 <__>

Present Use & Developments C30 <_____>

Potential Use C40 <_____>

Inferred Heat Source C50 <_____>

Depths to Production Zones

Zone 1 C70 <_____ units _____>

Zone 2 C80 <_____ units _____>

Thickness of Production Zones

Zone 1 C100 <_____ units _____>

Zone 2 C110 <_____ units _____>

Average Temperature of Production Zones

Zone 1 C114 <_____ units _____>

Zone 2 C115 <_____ units _____>

Surface Thermal Activity C120 <_____>

Associated Deposits	C130	< _____ >
No. of Hot Springs	C135	< _____ >
Electric Power Capacity	C140	< _____ > (units)
Year Production Began	C150	< _____ >
Number of Wells		
Producing	C170	< _____ >
Injection	C180	< _____ >
Test	C190	< _____ >
Abandoned	C195	< _____ >
Other	C200	< _____ >
Total No. of Wells	C210	< _____ >
Principal Exploration Techniques	C220	< _____ >
Comments (General Description)	C230	< _____ >

Geothermal Characteristics

Main Reservoir Fluid	E10	< _____ >
Natural Surface Discharge	E20	< _____ > (units)
	E16 Measured E17 Estimated (Circle Label)	
Total Calculated Discharge of Deep Water	E15	< _____ > (units)
Natural Recharge	E30	< _____ > (units)
Injection Recharge	E40	< _____ > (units)
Total Natural Heat Flux	E50	< _____ > (units)
Total Withdrawal Flux	E60	< _____ > (units)
Excess Withdrawal/Natural	E70	< _____ >

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Heat Flow of Surrounding Area E75 < units >

Range of Spring Temperatures E76 < units > to E77 < units >

Spring Description (if no temp. measured) E78 < Boiling Hot Warm > (Circle word)

Well information

Maximum Well Temperature E95 < units >

Depth Datum E96 < units >

Bottom-Hole Temperature E97 < units >

Depth Datum E98 < units >

Ave. Thermal Gradient E80 < units >

Comments E90 < >

Reservoir Properties

Reservoir Temperatures R15 < units >

to R20 < units >

R30 Assumed R40 Measured (Circled Label)

Best Estimate R50 < units >

Based on R55 < >

Subsurface Area R60 < units >

to R70 < units >

Best Estimate R100 < units >

Based on R110 < >

Depth to Reservoir Top R120 < units >

to R130 < units >

Best Estimate R140 < units >

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Depth to Reservoir Bottom	R145	< ____|____ > units
to	R146	< ____|____ > units
Best Estimate	R147	< ____|____ > units
Reservoir Thickness	R150	< ____|____ > units
to	R160	< ____|____ > units
Best Estimate	R170	< ____|____ > units
Reservoir Volume	R180	< ____|____ > units
to	R190	< ____|____ > units
Best Estimate	R200	< ____|____ > units
Porosity	R210	< _____ > to R220 < _____ >
Best Estimate	R230	< _____ >
Avc. Well Flow (Mass)	R270	< ____|____ > units
to	R280	< ____|____ > units
Well Diameter	R290	< ____|____ > units
Comments	R300	< _____ >

Reserves

Total Stored Heat	F13	< ____|____ > units
to	F14	< ____|____ > units
Best Estimate	F10	< ____|____ > units
Depth Datum	F20	< ____|____ > units
Temperature Datum	F30	< ____|____ > units
Recoverable Heat	F40	< ____|____ > units
Depth Datum	F50	< ____|____ > units
Temperature Datum	F60	< ____|____ > units

Method Used F70 <_____>

Recoverable By-Product F80 <_____>

Potential By-Product F90 <_____>

Comments (Reserves): F100 <_____>

Geology

General Rock Types G10 <_____>

Cap Rock G30 <_____>

Aquifer G40 <_____>

Depth G50 <_____ units>

Thickness G60 <_____ units>

Cap Rock G70 <_____>

Aquifer G80 <_____>

Depth G90 <_____ units>

Thickness G100 <_____ units>

Other Horizons & Units G20 <_____>

Comments (Horizons): G110 <_____>

Hydrothermal Index Minerals G120 <_____>

Important Control or Locus G140 <_____>

Other Structures or Trends G130 <_____>

Hydrology G150 <_____>

_____>

Comments (Geology): G160 <_____

_____>

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Geophysics

Gravity Survey Information	J20	< _____ >
Magnetic Survey Information	J30	< _____ >
Seismic Survey Information	J40	< _____ >
Electrical Resistivity	J50	< _____ >
Other Geophysical Resistivity	J60	< _____ >
Comments (Geophysics):	J70	< _____ >
Environmental Factors	H18	< _____ >

Primary Reference (Geothermal Field)

Author	K20	< _____ >
Date	K30	< _____ >
Title	K40	< _____ >
Reference	K50	< _____ >

References

1)	K70	< _____ >
2)	K80	< _____ >
3)	K90	< _____ >
4)	K100	< _____ >

Instructions

Record Identification

A10 Record No.
A sequential number to be assigned to the record by the file supervisor.

A20 Cross Index No.
A number used to index records with some common characteristic. It is assigned by the file supervisor but may be requested by the reporter.

A25 Revision
If a record is updated, an "R" will be assigned to the record in this label. The file supervisor will assign it only to the most recently updated records.

A30 Record Type
The letter "A" identifies this record as a *geothermal field record.*

Reporter

A50 Name
The name of the person completing the form. Enter last name, first name, and middle initial. This information is required.

A60 Date
The date on which the form was completed or the date of update. The year is entered before the month.

A70 Organization
The organization which the reporter represents.

Geographic Locality

B10 Name of Field-Area
The most commonly accepted name of the geothermal field. A field does not have to be a Known Geothermal Resource Area (KGRA).

B13 Users of Area
The names of corporations or organizations that are using or developing the geothermal field.

B14 Waring Figure

B15 Waring Number
These two labels refer to the numbering system of U. S. Geological Survey Professional Paper 492, "Thermal Springs of the United States and Other Countries of the World," by G. S. Waring. Leave blank if not known.

B40 Country Code

B50 Country Name
Country code refers to a two letter code found in Appendix A. Country name requires the spelled-out name.

B60 State/Province
Space for any second-order political subdivision.

B65 County
Space for any third-order political subdivision

B70 Latitude

B80 Longitude
Enter latitude and longitude in the given format. If accuracy is to the nearest minute then leave the second field blank. For large areas choose an arbitrary center point. Enter leading zeroes where necessary.

Examples: B70 <3,5,-,4,4,-, , ,N,>

B80 <0,4,2,-,5,2,-,0,3,W,>

B81 Available Maps of Area

List any maps that help locate or define the geothermal area.

B95, B105, B115 Township, Range, Section, ¼, ¼

Enter the township-range information in the specific format. Leave the "¼" areas blank if a range of sections is entered. Do not enter the T for Township or the R for Range.

Example: B95 <18N>

B105 <09E>

B115 <10 SW NW>

SECTION ¼ ¼

(The NW ¼ of the SW ¼ of Section 10)

The locations of a point by Township, Range, and Section is not recommended because this method is mathematically unprecise and therefore difficult to deal with in the computer. Latitude and longitude are far superior to the Twp-Rg-Sec method. However, inasmuch as many locations in the literature are given only Twp-Rge-Sec, it has been included here.

B125 Base and Meridian

Enter the base and meridian from which Township-Range localities are measured.

B83 Other Locality Information

Space for any other helpful locality information, such as position from the nearest prominent locality.

General Description

C10 Size of Surface Expression

The area of the known surficial activity. The contents of this label should conform to the numeric standards of the file (Appendix B in this manual).

B140 Elevation

For a large area, select elevation of a central point. The contents of this label should conform to the numeric standards of the file (Appendix B in this manual).

C15 Resource Category

Enter a one-letter code to indicate one of the following reservoir systems:

A. Vapor-Dominated
B. Hot Water 150°C
C. Hot Water 90 to 150°C
D. Low Temperature 90°C
E. Unknown

C20 Development Status

A one-digit number indicating one of four situations following the New Zealand system.

From: Grindley, G. W., and Nathan, S., 1974, Assessment of geothermal energy resources: New Zealand Geological Survey Report NZGA 38, Part D. Geothermal Resources, 10 p.

Class 1. Boundaries of geothermal field known fairly accurately on at least three sides. Temperatures known down to 2 km/and at many localities down to 2 km. Production zones well defined by drilling, and wells tested and stabilized to provide at least 75% of estimated resources.

Class 2. Area of field known approximately from drill holes or detailed resistivity traverses. Temperatures known down to 1 km. A few wells tested and stabilized, but production zones poorly defined by drill holes.

Class 3. Areas of field and temperatures poorly known because of lack of deep drill holes. Characteristics inferred from chemistry and/or reconnaissance resistivity traverses.

Class 4. Information on hot springs only. No subsurface data and no resistivity traverses.

C30 Present Use and Developments

C40 Potential Use
Key words are recommended: electric power, process heat, space head, recreation, chemicals, distilled water, etc.

C50 Inferred Heat Source
Volcanism, thermal gradient, faulting, etc.

C70, C80 Depths to Production Zones

C100, C110 Thicknesses of Production Zones

C114, C115 Temperatures of Production Zones
Space is provided for two possible production zones. The contents of these labels should conform to the numeric standards of the file (Appendix B in this manual).

C120 Surface Thermal Activity
Geysers, hot springs, fumaroles, etc.

C130 Associated Deposits
Sinter, travertine, etc.

C135 No. of Hot Springs
The number of known thermal springs within the surface expression of the geothermal area.

C140 Electric Power Capacity

C150 Year Productuion Began
The present generating capacity of any existing power plants (C140) and the year in which production began (C150). The contents of label C140 should conform to the numeric standards of the file (Appendix B in this manual).

C170-C210 Number of Wells
List the number of each type of well.

C220 Principal Exploration Techniques
Use categorical descriptions such as: geology, geophysics, drill holes, chemical analysis, etc.

C230 Comments
Use to include additonal information or to clarify or qualify information entered in the General Description section.

Geothermal Characteristics

E10 Main Reservoir Fluid
Steam, water, water and steam, etc.

E20 Natural Surface Discharge

E16, E17 Measured, Estimated
The total natural surface discharge of the field. Circle only the label (i.e., E16 or E17) which indicates whether natural discharge was measured or estimated. The contents of label E20 should conform to the numeric standards of the file (Appendix B in this manual).

E15 Total Calculated Discharge of Deep Waters
The total natural discharge including discharge into rivers, streams, etc. The contents of this label should conform to the numeric standards of the file (Appendix B in this manual).

E30 Natural Recharge
The total recharge of the geothermal field from underground sources, streams, etc. The contents of this label should conform to the numeric standards of the file (Appendix B in this manual).

E40 Injection Recharge
The recharge of the field from injection wells. The contents of this label should conform to the numeric standards of the file (Appendix B in this manual).

E50 Total Natural Heat Flux
Heat flux of entire geothermal field. (Sample units: joules/second.) The contents of this label should conform to the numeric standards of the file (Appendix B in this manual).

E60 Total Withdrawal Flux
The rate of withdrawal for the entire geothermal field. (Sample units: joules/second.) The contents of this label should conform to the numeric standards of the file (Appendix B in this manual).

E70 Excess Withdrawal/Natural
A ratio to indicate the relation of withdrawal flux to natural heat flux. No units are required.

E75 Heat Flow of Surrounding Area
Heat/Area/Time outside the geothermal area. The contents of this label should conform to the numeric standards of the file (Appendix B in this manual).

E76, E77 Range of Spring Temperatures
If only one temperature is available, then enter under label E76. The contents of both labels should conform to the numeric standards of the file (Appendix B in this manual).

E78 Spring Description
If there are no measured temperatures available for the springs, then circle the word that best describes the temperature.

Well Information

E95 Maximum Well Temperature

E96 Depth Datum
The maximum measured temperature (E95) at a specified depth (E96) that was recorded in a representative well of the geothermal field. The contents of these labels should conform to the numeric standards of the file (Appendix B in this manual).

E97 Bottom Hole Temperature

E98 Depth Datum
The bottom hole temperature (E97) and depth (E98) of a representative well of the geothermal field. The contents of these labels should conform to the numeric standards of the file (Appendix B in this manual).

E80 Ave. Thermal Gradient
The change in temperature divided by the change in depth. The contents of this label should conform to the numeric standards of the file (Appendix B in this manual).

E90 Comments
Use to include additional information or to clarify or qualify information entered in the Geothermal Characteristics Section.

Reservoir Properties

Reservoir Temperatures

R15, R20 Temperatures

R30, R40 Assumed, Measured
Space is provided for a range of temperatures. Fill in label R15 if only one temperature is available. Circle only the label (i.e., R30 or R40) that indicates whether the temperatures have been measured or assumed. The contents of labels R15 and R20 should conform to the numeric standards of the file (Appendix B in this manual).

R50 Best Estimate

R55 Based On:
The best estimate of the reservoir temperature (R50) and the information upon which it is based (R55). The contents of label R50 should conform to the numeric standards of the file (Appendix B in this manual).

Subsurface Area

R60, R70 Area Range
Space is provided for a range of numbers. If only one number is available, then enter it under R60. The contents of these labels should conform to the numeric standards of the file (Appendix B in this manual).

R100 Best Estimate

R110 Based On:
The best estimate for the field of the subsurface area (R100) and the information upon which it is based. The contents of label R100 should conform to the numeric standards of the file (Appendix B in this manual).

Reservoir Dimensions

R120, R130, R140 Depth to Reservoir Top

R145, R146, R147 Depth to Reservoir Bottom

R150, R160, R170 Reservoir Thickness

R180, R190, R200 Reservoir Volume
Ranges and a best estimate are asked for in each case. If only one measurement for any are available, then enter it under the first label for each (i.e., R120, R145, R150, R180).

The contents of these labels should conform to the numeric standards of the file (Appendix B in this manual).

R210, R220, R230 Porosity
No units needed. Enter the estimate that characterizes the reservoir.

R270, R280 Ave. Well Flow (Mass)

R290 Well Diameter
The average mass flow of wells in the geothermal field and the most common well diameter. The contents of these labels should conform to the numeric standards of the file (Appendix B in this manual).

R300 Comments
Use to include additional information or to clarify or qualify information entered in the Reservoir Properties section.

F13, F14 Total Stored Heat

F10 Best Estimate

F20 Depth Datum

F30 Temperature Datum

The total heat content of the field (F13, F14) above a certain temperature (F30) to a specified depth (F20). Best Estimate (F10) is reserved for a number that characterizes the geothermal field. The contents of all these labels should conform to the numeric standards of the file (Appendix B in this manual).

F40 Recoverable Heat

F50 Depth Datum

F60 Temperature Datum

The calculated recoverable heat of the geothermal field (F40) above a certain temperature (F60) to a specified depth (F50). The contents of these labels should conform to the numeric standards of the file (Appendix B in this manual).

F70 Method Used

The method used to calculate the recoverable heat, e.g., the stored-heat method (Muffler, 1973, USGS, Professional Paper 820), or the natural heat-flow method (Grange, 1955, New Zealand, D.S.I.R. Bull. 117).

F80 Recoverable Byproducts

Enter any byproducts being recovered or considered to be recoverable under present conditions.

F90 Potential Byproducts

Enter any byproducts which, although not extractable under present conditions, nevertheless represent a possible future resource.

F100 Comments

Use to include additional information or to clarify or qualify information entered in the Reserves section.

Geology

G10 General Rock Types
Space for general text information on rock types (sedimentary, volcanic, etc.), rock description (porous, cemented, etc.), age, or lithology.

G30, G70 Cap Rock

G40, G80 Aquifer

G50, G90 Depth

G60, G100 Thickness
Space is provided for the existence of two cap rocks and two aquifers. The stratigraphic name, rock type or both are requested. The depth (G50, G90) and thickness (G60, G100) of both aquifers are requested. The numeric information should conform to the numeric standards of the file (Appendix B in this manual).

G20 Other Horizons and Units
Space for important rock units other than the mentioned cap rocks and aquifers.

G110 Comments (Horizons)
Space for additional information on the rock types and horizons.

G120 Hydrothermal Index Minerals
Hydromica, adularia, zeolite, clay, etc.

G140 Important Control or Locus
Enter any known controls relating to the location, size, and/or shape of the geothermal field.

G130 Other Structures or Trends
The presence of any other important structures or trends in the area.

G150 Hydrology
Space for general information on the hydrology of the area.

G160 Comments
Use to include additional information or to clarify or qualify information entered in the Geology section.

Geophysics

J20 Gravity Survey Information

J30 Magnetic Survey Information

J40 Seismic Survey Information

J50 Electrical Survey Information

J60 Other Geophysical Resistivity
J20-J60 provide for information to be entered on several of the common types of geophysical surveys. Enter the dates and any other descriptive information.

J70 Comments
Use to include additional geophysical information.

H18 Environmental Factors
Space for general information on environmental aspects of the geothermal field.

References

K20 Author

K30 Date

K40 Title

K50 Reference
The most important reference used in completing this form. A reference of some kind is required.

K70-K100 References
This space is for any other references used to complete this form. This might include names of individuals who contributed information for certain labels of this form.

SECTION B - CHEMICAL ANALYSIS

Input form

This form is designed to include chemical analysis information on water, steam condensate and/or gas samples. If water and vapor samples were collected simultaneously then the information for both should be put on one of these forms. The form consists of eight pages:

Page 1 : Record and Locality Information.

Page 2 : Surface sample information. Fill this page if the sample was collected from the surface source such as snow, spring, lake, etc. Draw a diagonal line through this page if the sample was a well sample.

Page 3 : Well sample information. Complete this page only for well samples. If not used draw a diagonal line through this page.

Page 4-5: Water analysis.

Page 6-7: Condensate analysis.

Page 8 : Residual gas analysis.

Please draw a diagonal line through empty pages. This makes it easier to keypunch the forms.

Section B - Chemical Analysis (H2)

Record Identification

Record No. A10 < >

Cross Index No. A20 < >

Record Type A30 < B >

Sample Type A34 < WELL SURFACE > (Circle word)

Reporter

Name A50 < >

Date A60 < Yr. / Mo. >

Organization A70 < >

Geographic Locality

Geothermal field B10 < >

Name of Sample Source B20 < >

Country Code B40 < >

Country Name B50 < >

State/Province B60 < >

County B65 < >

Latitude B70 < D - M N/S >

Longitude B80 < D - M E/W >

Township, Range, Section, 1/4, 1/4

B95< Township > B105< Range > B115< Section 1/4 1/4 >

USGS WRD Well-Spring Numbering System

B116 < >

Other Grid System

System Used B100 < >

X Coord. B110 < >

Y Coord. B120 < >

UTM Zone No. B130 < >

Map Reference B82 < >

Other Locality Information B83 < >

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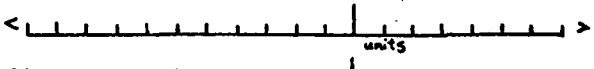
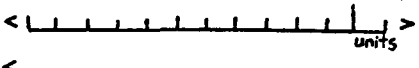
Surface Sample Information

Source Type	S10	< _____ >
Sample No.	M190	< _____ >
Collection Date	M200	< _____ >
Collector(s)	S20	< _____ >
Point of Collection	N210	< _____ >
Volume Flow Rate of Spring	M220	<  >
Temperature	M210	<  >
Qualitative Steam/Water Ratio	S40	< _____ >
Deposits or Alteration	S30	< _____
		_____ >
Water Treatment Data	M234	< _____
		_____ >
Other Sample Information	S50	< _____
		_____ >
References	M790	< _____
		_____ >

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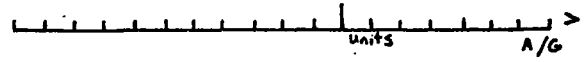
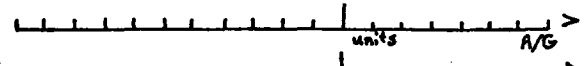
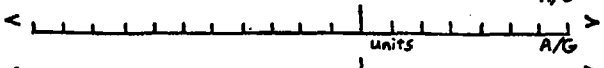
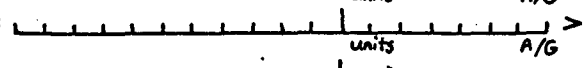
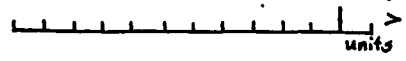
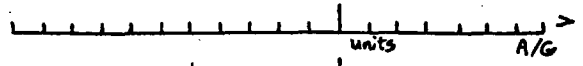
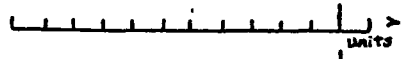
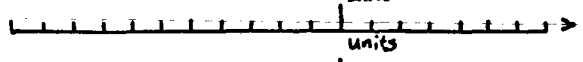
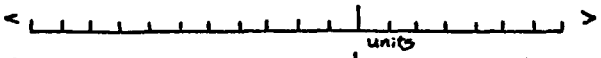
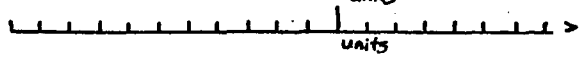
Well Sample Information

Sample No.	M190	< _____ >
Collection Date	M200	< _____ >
Collector(s)	S20	< _____ >
References	M790	< _____ >
Wellhead Status	N10	< _____ >
Wellhead Pressure	N30	<  >
Water		
Point of Collection	P55	< _____ >
Separation Pressures		
First	P60	<  >
Second	P70	<  >
Third	P80	<  >
Water Sampling Temp.	M210	<  >
Steam		
Point of Collection	P75	< _____ >
Separation pressure	P65	<  >
Steam Sampling Temp.	S60	<  >
Steam Flow Rate (Mass)	N50	<  >
Water Flow Rate (Mass)	M220	<  >
Enthalpy of Total Flow	N60	<  >
Water Treatment Data	M234	< _____ >
Other sample information	S50	< _____ >

Water Analysis — A31 < W >

- Analysis Date — M233 <_____>
- Analyst(s) — M236 <_____>
- pH 1) — M20 <_____> At M20A <Temp. | units>
- 2) — M202 <_____> At M202A <Temp. | units>
- Eh — M221 <units>
- Temperature — M222 <units>
- Specific Gravity — M91 <_____>
- Specific Conductance — M21 <units>
- Temperature — M740 <units>
- Alkalinity — M22 <units>
- Total Dissolved Solids — M23 <units>
- Total Suspended Solids — M24 <units>

Isotopic Data

- Del O (18) of Water — Q270 <units>
- Del D of Water — Q250 <units>
- Del C (13) of Dissolved CO_2 — Q150 <units>
- Del O (18) of Dissolved SO_4 — Q200 <units>
- Del S (34) of Dissolved SO_4 — Q190 <units>
- Del S (34) of Dissolved H_2S — Q185 <units>
- Tritium Content of Water — Q186 <units>
- C(14) Content of CO_2 — Q187 <units>
- Other — Q310 <_____>

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Solute Analysis (Water)

Units Used M341 <_____>

Li	M30	<_____>	Mg	M70	<_____>	Cu	M360	<_____>	F	M90	<_____>
Na	M40	<_____>	Ca	M60	<_____>	Zn	M390	<_____>	Cl	M80	<_____>
K	M50	<_____>	Sr	M380	<_____>	Hg	M440	<_____>	Br	M350	<_____>
Rb	M480	<_____>	Ba	M330	<_____>	B	M120	<_____>	I	M490	<_____>
Cs	M500	<_____>	Ca+Mg	M180	<_____>	HBO_2	M170	<_____>	O_2	M610	<_____>
Na+K	M300	<_____>	Mn+3	M630	<_____>	Al	M310	<_____>	N_2	M530	<_____>
NH_4	M150	<_____>	Mn(TOT)	M520	<_____>	Pb	M370	<_____>	CO_2	M570	<_____>
NO_3	M590	<_____>	Fe+3	M620	<_____>	As	M320	<_____>	SO_2	M540	<_____>
PO_4	M600	<_____>	Fe(TOT)	M510	<_____>	Sb	M470	<_____>	H_2S	M160	<_____>
SiO_2	M130	<_____>				U	M450	<_____>	H_2	M550	<_____>
SO_4	M110	<_____>							CH_4	M560	<_____>
CO_3	M580	<_____>									
HCO_3	M140	<_____>									

Rare Earths Analyzed M750 <_____>

Actinides Analyzed M760 <_____>

Rare Gases Analyzed M770 <_____>

Other Solutes & Gases M780 <_____>

_____>

Comments M800 <_____

_____>

Condensate Analysis	A32	< C >
Analysis Date	S70	< >
Analyst(s)	S80	< >
pH 1)	N191	< > At N191A < Temp. units >
2)	S100	< > At S100A < Temp. units >
Eh	S110	< units >
Temperature	S130	< units >
Specific Gravity	S140	< >
Specific Conductance	S150	< units >
Temperature	S160	< units >
Alkalinity	S170	< units >
Total Dissolved Solids	S180	< units >
Total Suspended Solids	S190	< units >
Isotopic Data		
Del O (18) of Water	Q260	< units >
Del D of Water	Q240	< units >
Del C (13) of Dissolved CO_2	S220	< units >
Del O (18) of Dissolved SO_4	S230	< units >
Del S (34) of Dissolved SO_4	S240	< units >
Del S (34) of Dissolved H_2S	S250	< units >
Tritium Content of Water	S260	< units >
C(14) Content of CO_2	S270	< units >
Other	S280	< >

Solute Analysis (Condensate)

Units Used T500 <_____>

Li	T10	<_____>	Mg	T140	<_____>	Cu	T230	<_____>	F	T330	<_____>
Na	T20	<_____>	Ca	T150	<_____>	Zn	T240	<_____>	Cl	T340	<_____>
K	T30	<_____>	Sr	T160	<_____>	Hg	T250	<_____>	Br	T350	<_____>
Rb	T40	<_____>	Ba	T170	<_____>	B	T260	<_____>	I	T360	<_____>
Cs	T50	<_____>	Ca+Mg	T180	<_____>	HBO_2	T270	<_____>	O_2	T370	<_____>
Na+K	T60	<_____>	Mn+3	T190	<_____>	Al	T286	<_____>	N_2	T380	<_____>
NH_4	T70	<_____>	Mn(TOT)	T200	<_____>	Pb	T290	<_____>	CO_2	T390	<_____>
NO_3	T80	<_____>	Fe+3	T210	<_____>	As	T300	<_____>	SO_2	T400	<_____>
PO_4	T90	<_____>	Fe(TOT)	T220	<_____>	Sb	T310	<_____>	H_2S	T410	<_____>
SiO_2	T100	<_____>				U	T320	<_____>	H_2	T420	<_____>
SO_4	T110	<_____>							CH_4	T430	<_____>
CO_3	T120	<_____>									
HCO_3	T130	<_____>									

Rare Earths Analyzed T440 <_____>

Actinides Analyzed T450 <_____>

Rare Gases Analyzed T460 <_____>

Other Solutes & Gases T470 <_____>

_____>

Comments T490 <_____

_____>

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Gas Analysis A33 < G >

Analysis Date U10 <_____>

Analyst(s) U20 <_____>

Gas/H_2O Ratio (mol/mol) U30 <_____>

Units Used N230 <_____>

CO_2	N80 <_____>		H_2	N120 <_____>		Ar	N183 <_____>	
H_2S	N90 <_____>		CH_4	N130 <_____>		Rn	N110 <_____>	
N_2	N140 <_____>		C_2H_6	N182 <_____>		Hg	N160 <_____>	
O_2	N150 <_____>		He	N170 <_____>				

Other Hydrocarbons U40 <_____>

Other U50 <_____>

Isotopic Data

Del C (13) of CO_2 U60 <_____ units>

C(14) Content of CO_2 U70 <_____ units>

Del C (13) of CH_4 Q170 <_____ units>

Del D of CH_4 U90 <_____ units>

Del D of H_2 Q220 <_____ units>

Del S (34) of H_2S U110 <_____ units>

Ratio Ar(40)/Ar(36) Q290 <_____>

Other U130 <_____>

Comments U140 <_____>

Instructions

Record Identification

A10 Record No.
A sequential number to be assigned to the record by the file supervisor.

A20 Cross Index No.
A number used to index records that have some common characteristic. It is assigned by the file supervisor but may be requested by the reporter.

A30 Record Type
The letter "B" identifies this record as a chemical analysis.

A34 Sample Type
Circle either "well" for samples collected from wells/drill holes or "surface" for samples collected from surface sources. This entry is required for each chemical analysis section.

Reporter

A50 Name
The name of the person completing the form. Enter last name, first name, and middle initial. This information is required.

A60 Date
The date on which the form was completed or the date of update. The year is entered before the month.

A70 Organization
The organization which the reporter represents.

Geographic Locality

B10 Geothermal Field/Area
The most commonly accepted name of the geothermal field. The area does not have to be a Known Geothermal Resource Area (KGRA).

B20 Name of Sample Source
For surface samples, the name of the spring, stream, lake, etc., from which the sample was collected. For well samples, the name or number of the well from which the sample was collected.

B40 Country Code

B50 Country Name
The country is listed as a two-character code (See Appendix A) and also fully spelled out (B50).

B60 State/Province
Space for any second-order political subdivision

B65 County
Space for any third-order political subdivision.

B70 Latitude

B80 Longitude
Enter latitude and longitude in degrees and minutes. Three decimal places are provided for the minutes. Enter minutes only to the nearest significant figure and leave the trailing digits blank. For example:

```
129-63.123E
129-63.12 E
129-63.1  E
```

Include leading zeroes where necessary.

R95 Township

B105 Range

B115 Section, ¼, ¼

Enter the township-range information in the given format. Do not enter T for township or R for range.

Example: B95 < 18N >

B105 < 09E >

B115 < 10 (Section) NW (1/4) SW (1/4) >

(The SW ¼ of the NW ¼ of Section 10)

The location of a point by Township, Range, and Section is not recommended because this method is mathematically unprecise and therefore difficult to deal with in the computer. Latitude and longitude are far superior to the Twp-Rge-Sec method. However, inasmuch as many locations in the literature are given only by Twp-Rge-Sec, it has been included here.

B116 U.S.G.S. WRD Well-Spring Numbering System

The numbering system used by the U.S. Geological Survey, Water Resources Division, indicates the locations of wells or springs within the official rectangular subdivision of public lands. The first two segments of the number designate the township and range. The third segment gives the section number, followed by three letters and a numeral, which indicate the quarter section, the 40-acre tract, the 10-acre tract, and the serial number of the well within the tract, respectively. Quarter sections are lettered a, b, c, and d in counterclockwise order from the northeast quarter of each section. Within each of the quarter sections, 40-acre and 10-acre tracts are lettered in the same manner. Well 6S-5E-10ddd1 is in the SE¼ SE¼ SE¼ sec. 10, T, 6S., R.5E., and was the first well inventoried in that tract. Enter this information where available.

Other Grid System

B100 System Used

B110 X Coord.

B120 Y Coord.

B130 UTM Zone No.

This group of labels can be used for any other grid systems such as State coordinate systems of Universal Transverse Mercator (UTM).

UTM coordinates provide a simple way of plotting a point. The UTM grid is shown on all USGS quadrangle maps printed since 1956. Grid lines drawn on the base map, together with a metric coordinate reader, make it a simple matter to plot a point in the UTM system.

To define a point in the UTM system, a Northing, Easting, and Zone No. are required. The world is divided into 60 meridional zones numbered from 1 to 60, each zone covering a strip 6° wide in longitude. The Northern and Southern Hemispheres must be indicated by a positive or negative value. If the Zone number is less than 10, insert a leading zero to the left of the number. The Zone number is indicated in the lower-left corner of 7½-minute topographic sheets.

Within each zone, coordinates are measured north and east in meters. For UTM and X-Coordinate = Easting and Y-Coordinate = Northing. Example of a point in the Northern Hemisphere:

X Coord.	B110 <	90123.> (Easting)
Y Coord.	B120 <	3598887.> (Northing)
UTM Zone No.	B130 <	+17 >

B82 Map Reference

Space for a map reference on which the sample source can be located or identified.

B83 Other Locality Information

Space for any additional locality information, such as position from nearest prominent locality.

Surface-Sample Information (P.2 of input form)

Complete this page for surface samples only. Draw a a diagonal line through this page if the sample is from a well.

S10 Source Type
Hot spring, cold spring, lake, stream, snow, sea water, fumarole, etc.

M190 Sample No.
The number assigned to the sample at collection time.

M200 Collection Date
Year, month, day. Example: 76/07/31

S20 Collector(s)
Last name, first name, middle initial.

N210 Point of Collection
Space to indicate a more precise place from which the sample was collected.

M220 Volume Flow Rate of Spring
The contents of this label should conform to the numeric standards of the file (Appendix B in this manual).

M210 Temperature
Temperature at collection time. The contents of this label should conform to the numeric standards of the file (Appendix B in this manual).

S40 Qualitative Steam/Water Ratio
A rough estimate of the relative amounts of steam and water from the sample source.

S30 Deposits or Alteration
The thermal deposits associated with the spring, fumarole, etc.

M234 Water-Treatment Data
Space to indicate whether the water sample was filtered, acidified, diluted, etc.

S50 Other Sample Information
Space for any other pertinent data that describe the sample.

M790 Reference
The source of this chemical analysis. Publications, personal files, official files, etc.

Well-Sample Information (P.3 of input form)

Complete this page for well samples only. Draw a diagonal line through this page if the sample is not a well sample.

M190 Sample No.
The number assigned to the sample at collection time.

M200 Collection Data
Year, month, day. Example: 76/07/31.

S20 Collector(s)
Last name, first name, middle initial.

M790 Reference
The source of this chemical analysis. Publications, personal files, official files, etc.

N10 Wellhead Status
Shut-in, flowing, high-flowing, etc.

N30 Wellhead Pressure
A/G represents absolute or gauge pressure. Enter the appropriate letter when known. The contents of this label should conform to the numeric standards of the file (Appendix B in the manual).

Water

P55 Point of Collection
Indicate whether the water sample came from a separator (first or second, if there are two), the silencer, or from some other point in the system.

Separation Pressures
P60 First
P70 Second
P80 Third
P60 and P70 refer to two separators if there are two. The "Third" pressure usually refers to the silencer.

These three fields provide space for the separation pressures the water had undergone before sampling. If the sample was collected at the first separator, then only the first separation pressure would be listed. The other fields would be blank.

If the sample was collected at the second separator, then only two separation pressures (First and Second) would be listed. (A/G = Absolute or Gauge). The contents of these labels should conform to the numeric standards of the file (Appendix B in this manual).

M210 Water Sampling Temp.
This number should conform to the numeric standards of the file (Appendix B in this manual).

Steam

P75 Point of Collection
Indicate whether the steam sample was collected from a separator or from some other point in the system.

P65 Separation Pressure
The separation pressure for the steam sample (A/G = Absolute or Gauge). This number should conform to the numeric standards of the file (Appendix B in this manual).

S60 Steam Sampling Temp.
This number should conform to the numeric standards of the file (Appendix B in this manual).

N50 Steam Flow Rate
Mass flow of the steam. This number should conform to the numeric standards of the file (Appendix B in this manual).

M220 Water Flow Rate
The mass flow rate of the liquid phase. This number should conform to the numeric standards of the file (Appendix B in this manual).

N60 Enthalpy of Total Flow
Enthalpy of water and steam. This number should conform to the numeric standards of the file (Appendix B in this manual).

M234 Water Treatment Data
Space to indicate whether the water sample was filtered acidified, diluted, etc.

S50 Other Sample Information
Space for any other pertinent data describing the sample.

Water Analysis (P.4 of input form)

A31 Water Analysis
The letter "W" indicates that this analysis includes a water analysis.

M233 Analysis Date
Year, month, day. Example: 76/07/31.

M236 Analyst(s)
List the names of the analysts who processed this sample and the aspect of the analysis for which each was responsible. Enter last names, first names, and middle initials.

M20 (pH 1)

M20A AT (TEMP.)

M202 (pH 2)

M202A AT (TEMP.)
Space is provided for two pH measurements where pH has been measured both in the lab and the field. Such qualifying information should be written after the pH number. For example: 7.5 Lab. Each pH measurement is accompanied by a temperature field to indicate the temperature at which pH was measured. The temperature fields must conform to the numeric standards of the file (Appendix B in this manual).

M221 Eh

M222 Temperature
The oxidation-reduction potential (M221) and the temperature at which it was measured (M222). These two numbers must conform to the numeric standards of the file (Appendix B in this manual).

M91 Specific Gravity
No units are required.

M21 Specific Conductance

M740 Temperature

The specific conductance (UMHOS/CM) and the temperature at which it was measured. These numbers must conform to the numeric standards of the file (Appendix B in this manual).

M22 Alkalinity

Alkalinity may be measured as carbonate ($CaCO_3$) or as bicarbonate (HCO_3). Indicate which is used after the spaces for units.

Example:

M22 <2,0,5,3, , , , , , |P,P,M, , HCO3 >

M23 Total Dissolved Solids

M24 Total Suspended Solids

These two numbers nust conform to the numeric standards of the file (Appendix B in this manual).

Isotopic Data

Q270 Del O (18) of Water

Q250 Del D of Water

Q150 Del C (13) of Dissolved CO_2

Q200 Del O (18) of Dissolved SO_4

Q190 Del S (34) of Dissolved H_2S

Q185 Del S (34) of Dissolved H_2S

Isotopic ratios should be reported with units (parts per thousand = 0/00). Unless stated otherwise, the base is standard mean ocean water (SMOW). These numbers should conform to the numeric standards of the file (Appendix B in this manual). (Del = δ).

Q186 Tritium Content of Water

Q187 C (14) Content of CO_2

The units for these two isotopes may be different from those for the other isotopes. Enter the appropriate units and make sure the numbers correspond to the numeric standards of the file (Appendix B in this manual).

Q310 Other

Space for additional isotopic quantities or information.

Solute Analysis (Water) (P. 5 of input form)

M341 Units Used

Indicate the units used for the solute concentrations. Example: PPM, MG/L, etc.

Chemical List

The solutes listed basically conform to the order of the periodic table. It may be necessary to calculate certain solutes because of the many possible forms. For example, both NH_4 and NH_3 are interchangeable parameters. As NH_4 is requested, the reporter may have to calculate NH_4 from NH_3, using the ratio of the molecular weights.

No units are required unless they differ from the units listed in the M341 label at the top of the page. Sometimes reports will contain parameters in milligrams/liter and micrograms/liter. Convert micrograms/liter to milligrams/liter by dividing by 1000. Use "LT" for "Less Than" and "GT" for "Greater Than."

M750 Rare Earths Analyzed

Indicate whether elements such as Yttrium (Y), Scandium (Sc), Hafnium (Hf), or elements of the Lanthanoid Series (57-71 of the periodic table) have been analyzed in the sample. No format is required.

M760 Actinides Analyzed

Indicate whether elements of the actinoid series (90-103 of the periodic table) have been analyzed in the sample. No format is required.

M770 Rare Gases Analyzed

Space for the presence of rare dissolved gases. No format is required.

M780 Other Solutes and Gases

Space for any other chemical constituents.

M800 Comments

Use for additional information or to qualify or clarify information for the water analysis.

Condensate Analysis (P.6 of input forms)

A32 Condensate Analysis
The letter "C" indicates that this analysis includes a condensate analysis.

S70 Analysis Date
Year, month, day. Example: 76/07/31.

S80 Analyst(s)
List the names of the analysts who processed this sample and the aspect of the analysis for which each was responsible. Enter last names, first names, and middle initials.

N191 pH 1)

N191A AT (TEMP.)

S100 pH 2)

S100A AT (TEMP.)
Space is provided for two pH measurements when pH has been measured both in the lab and the field. Such qualifying information should be written after the pH number. For example: 7.5 Lab. Each pH measurement is accompanied by a temperature field to indicate the temperature at which pH was measured. The temperature fields must conform to the numeric standards of the file (Appendix B in this manual).

S110 Eh

S130 Temperature
The oxidation-reduction potential (M221) and the temperature at which it was measured (M222). These two numbers must conform to the numeric standards of the file (Appendix B in this manual).

S140 Specific Gravity
No units are required.

S150 Specific Conductance

S160 Temperature

The specific conductance (UMHOS/CM) and the temperature at which it was measured. These numbers must conform to the numeric standards of the file (Appendix B in this manual).

S170 Alkalinity

Alkalinity may be measured as carbonate ($CaCO_3$) or bicarbonate (HCO_3). Indicate which is used after the spaces for units.

Example:

M22 <2,0,5,3,. . . . . |P,P,M, HCO3 >

S180 Total Dissolved Solids

S190 Total Suspended Solids

These two numbers must conform to the numeric standards of the file (Appendix B in this manual).

Isotopic Data

Q260 Del O (18) of Water

Q240 Del D of Water

S220 Del C (13) of Dissolved CO_2

S230 Del O (18) of Dissolved SO_4

S240 Del S (34) of Dissolved SO_4

S250 Del S (34) of Dissolved H_2S

Isotopic ratios should be reported with units (parts per thousand = 0/00). Unless stated otherwise, the base is standard mean ocean water (SMOW). These numbers should conform to the numeric standards of the file (Appendix B in this manual) (Del = δ).

S260 Tritium Content of Water

S270 C (14) Content of CO_2

The units for these two isotopes may be different from those for the other isotopes. Enter the appropriate units and make sure the numbers correspond to the numeric standards of the file (Appendix B in this manual).

S280 Other

Space for additional isotopic quantities or information.

Solute Analysis (Condensate) (P. 7 on input form)

T500 Units Used

Indicate the units used for the solute concentrations.
Example: PPM, MG/L, etc.

Chemical List

The solutes listed basically conform to the order of the periodic table. It may be necessary to calculate certain solutes because of the many possible forms. For example, both NH_4 and NH_3 are interchangeable parameters. As NH_4 is requested, the reporter may have to calculate NH_4 from NH_3, using the ratio of the molecular weights.

No units are required unless they differ from the units listed in the T500 label at the top of the page. Sometimes reports will contain parameters in milligrams/liter and micrograms/liter. Convert micrograms/liter to milligrams/liter by dividiing by 1000. Use "LT" for "Less Than" and "GT" for "Greater Than."

T440 Rare earths Analyzed

Indicate whether elements such as Yttrium (Y), Scandium (Sc), Hafnium (Hf), or elements of the Lanthanoid Series (57-71 of the periodic table) have been analyzed in the sample. No format is required.

T450 Actinides Analyzed

Indicate whether elements of the actinoid series (90-103 of the periodic table) have been analyzed in the sample. No format is required.

T460 Rare Gasses Analyzed

Space for the presence of rare dissolved gases, No format is required.

T470 Other Solutes and Gases

Space for any other chemical constituents.

T490 Comments

Use for additional information or to qualify or clarify information for the condensate analysis.

Gas Analysis (P. 8 on input form)

A33 Gas Analysis
The letter "G" indicates that this analysis includes a residual gas analysis.

U10 Analysis Date
Year, month, day, Example: 76/07/31.

U20 Analyst(s)
The names of those who performed the gas analysis. Enter last name, first name, and middle initial.

U30 Gas/H_2O Ratio (mol/mol)
The ratio of the residual gas to steam (H_2O)

N230 Units Used
The units used for the following gas concentrations.

Residual Gases
No units are required unless they differ from units specified in label N230 above. Use "LT" for "Less Than" and "GT" for "Greater Than."

U40 Other Hydrocarbons

U50 Other
These two labels provide space to include the measurement of other gases in the sample.

Isotopic Data

U60 Del C (13) of CO_2

U70 C (14) Content of CO_2

Q170 Del C (13) of CH_4

U90 Del D of CH_4

Q220 Del D of H_2

U110 Del S (34) of H_2S

Isotopic ratios should be reported with units (parts per thousand = 0/00). Unless stated otherwise, the base is standard mean ocean water (SMOW). The C(14) content of CO_2 may have different units than the other isotopes. These numbers should conform to the numeric standards of the file (List B in this manual) (Del = δ).

Q290 Ratio Ar (40/Ar(36))

No units are required for this number.

U130 Other

Space for additional isotopic measurements of residual gas.

U140 Comments

Use for additional information or to clarify or qualify information for the gas analysis.

SECTION C - Geothermal Well/Drill hole

Input form

This input form is designed for geothermal well records. Informatiion includes locality, description, and well performance.

GEOTHERMAL RESOURCES FILE (GEOTHERM)
Revision 8 (February 1976)

Section C - Geothermal Well/Drillhole (H3)

Record Identification

Record No. A10 <>

Cross Index No. A20 <>

Record Type A30 < C >

Reporter

Name A50 <>

Date A60 <Yr./Mo.>

Organization A70 <>

Geographic Locality

Geothermal Field B10 <>

Well Name or No. B30 <>

Drilled By B35 <>

Country Code B40 <>

Country Name B50 <>

State/Province B60 <>

County B65 <>

Latitude B70 <D-M-S/N>

Longitude B80 <D-M-S/E/W>

Township, Range, Section, 1/4, 1/4

B95<Township> B105<Range> B115<Section 1/4 1/4>

USGS WRD Well-Spring Numbing System

B116 <>

Other Grid System

System Used B100 <>

X Coord. B110 <>

Y Coord. B120 <>

UTM Zone No. B130 <>

Map Reference B82 <>

Other Locality Information B83 <>

General Description

Type of Well	D10	< _____ >
Date Drilling Began	D11	< _____ >
Completion Date	D12	< _____ >
Date Abandoned	D13	< _____ >
Depth of Hole	D20	< _____ > units
Water Level	D25	< _____ > units
Production Casing: Length	D40	< _____ > units
Diameter	D50	< _____ > units
Wellhead Elevation	B150	< _____ > units
Steam Production Method	D60	< _____ >
Comments (General Description)	C230	< _____ >

Well Performance

Shutin Measurements

Date	L20	< _____ >
Downhole Pressure	L30	< _____ > units A/G
Downhole Temperature	L40	< _____ > units
Depth of Measurements	L50	< _____ > units
Wellhead Pressure	L60	< _____ > units A/G

High Flow Rate Measurements

Date	L80	< _____ >
Self-Driving or Under Pump	L90	< _____ >
Flowing Wellhead Pressure	L100	< _____ > units A/G
Temperature	L105	< _____ > units

Section C - Page 3

Steam-Vapor Flow Rate (Mass) L110< units >

Water-Liquid Flow Rate (Mass) L120< units >

Enthalpy of Steam-Vapor L130< units >

Enthalpy of Water-Liquid L140< units >

Mass Flow (Combined Phases) L101< units >

Enthalpy (Combined Phases) L102< units >

Intermediate Flow Rate Measurements

Date L63 < _____ >

Mass Discharge L64 < units >

Wellhead Pressure L65 < units n/c >

Enthalpy L66 < units >

Comments (Performance): L160< _____ >

Primary Reference

Author K20 < _____ >

Date K30 < _____ >

Title K40 < _____ >

Reference K50 < _____ >

Other References

1) K70 < _____ >

2) K80 < _____ >

Instructions

Record Identification

A10 Record Type
A sequential number to be assigned to the record by the file supervisor.

A20 Cross Index No.
A number used to index records with some common characteristic. It is assigned by the file supervisor but may be requested by the reporter.

A30 Record Type
The letter "C" identifies this record as a geothermal well record.

Reporter

A50 Name
The name of the person completing the form. Enter last name, first name, and middle initial. This information is required.

A60 Date
The date on which the form was completed or the date of update. The year is entered before the month.

A70 Organization
The organization which the reporter represents.

Geographic Locality

B10 Geothermal Field
The most commonly accepted name of the geothermal field. A field does not have to be a Known Geothermal Resource Area (KGRA).

B30 Well Name or No.
A number or name that uniquely identifies the well. If no name or number has been assigned, then identify the well with respect to some geographic marker.

B35 Drilled By
The name of the company or person who drilled the well.

B40 Country Code

B50 Country Name
Country Code refers to a two-letter code found in List A. Country name requires the spelled-out name.

B60 State/Province
Space for any second-order political subdivision.

B65 County
Space for any third-order political subdivision.

B70 Latitude

B80 Longitude

B80 Longitude
nter latitude and longitude in degrees and minutes. Three decimal places are provided for the minutes field. Enter minutes only to the nearest significant figure available and leave the trailing digits blank. For example:

129-63.123E
129-63.12 E
129-63.1 E

Include leading zeros where necessary.

B95 Township

B105 Range

B115 Section, ¼, ¼

Enter the township-range information in the given format. Do not enter T for township or R for range.

Example: B95 < 1,8,N, >

B105 < 0,9,E, >

B115 < 1,0, SECTION ... N,W, 1/4 ... S,W, 1/4 >

(The SW ¼ of the NW ¼ of Section 10)

The location of a point by Township, Range, and Section is not recommended because this method is mathematically unprecise and therefore difficult to deal with in the computer. Latitude and longitude are far superior to the Twp-Rge-Sec method. However, as many locations in the literature are given only by Twp-Rge-Sec, it has been included here.

B116 U.S.G.S. WRD Well-Spring Numbering System

The numbering system used by the U.S. Geological Survey, Water Resources Division, indicates the locations of wells or springs within the official rectangular subdivision of public lands. The first two segments of the number designate the township and range. The third segment gives the section number, followed by three letters and a numeral, which indicate the quarter section, the 40-acre tract, the 10-acre tract, and the serial number of the well within the tract, respectively. Quarter sections are lettered a, b, c, and d in counterclockwise order from the northeast quarter of each section. Within the quarter sections, 40-acre and 10-acre tracts are lettered in the same manner. Well 6S-5E-10ddd1 is in the SE¼ SE¼ SE¼ sec. 10, T. 6S., R.5E., and was the first well inventoried in that tract. Enter this information where available.

Other Grid System

B100 System Used

B110 X Coord.

B120 Y Coord.

B130 UTM Zone No.

This group of labels can be used for any other grid systems such as State coordinate systems or Universal Transverse Mercator (UTM).

UTM coordinates provide a simple way of plotting a point. The UTM grid is shown on all USGS quadrangle maps printed since 1956. Grid lines drawn on the base map, together with a metric coordinate reader, make it a simple matter to plot a point in the UTM system.

To define a point in the UTM system, a Northing, Easting, and Zone No. are required. The world is divided into 60 meridional zones numbered from 1 to 60, each zone covering a strip 6^{o} wide in longitude. The Northern and Southern Hemispheres must be indicated by a positive or negative value. If the Zone number is less than 10, insert a leading zero to the left of the number. The Zone number is indicated in the lower-left corner of 7½-minute topographic sheets.

Within each zone, coordinates are measured north and east in meters. For UTM and X-Coordinate = Easting and Y-Coordinate = Northing. Example of a point in the Northern Hemisphere:

X	Coord.	B110 <	90123. > (Easting)
Y	Coord.	B120 <	3598887. > (Northing)
UTM	Zone No.	B130 <	+17 >

B82 Map Reference

Space for a map reference on which the sample source can be located or identified.

B83 Other Locality Information

Space for any additional locality information, such as position from nearest prominent locality.

General Description

D10 Type of Well
Production, observation, abandoned, etc.

D11 Date Drilling Began

D12 Completion Data

D13 Date Abandoned
Enter these pertinent dates with the format: Year/Month/Day.

D20 Depth of Hole
The contents of this label should conform to the numeric standards of the file (Appendix B in this manual).

D25 Water Level
The present water level in the well. The contents of this label should conform to the numeric standards of the file (Appendix B in this manual).

Production Casing

D40 Length

D50 Diameter
If the wells have been cased, then enter this information on the length and diameter of the cased part.

D60 Steam Production Method
Down-hole flashing, separation from water, etc.

C230 Comments
Use to include additional information or to clarify or qualify the above information.

Well Performance

Shut-In Measurements
Measurements when the well was closed off.

L20 Date
Date measurements were made. Enter in format: Year/Month/Day.

L30 Downhole Pressure
Enter "A" for absolute pressure or "G" for gauge pressure in the last space of the units field. If unknown, leave blank. This number should conform to the numeric standards of the file (Appendix B in this manual).

L40 Downhole Temperature
This number should conform to the numeric standards of the file (Appendix B in this manual).

L50 Depth of measurements
The depth at which the downhole temperature and pressure were measured. This number should conform to the numeric standards of the file (Appendix B in this manual).

L60 Wellhead Pressure
Enter "A" for absolute pressure or "G" for gauge pressure in the last space of the units field. If unknown, leave blank. This number should conform to the numeric standards of the file (Appendix B in this manual).

High-Flow-Rate Measurements
Measurements recorded during unrestricted flow at the wellhead.

L80 Date
Date measurements were made. Enter in format: Year/Month/Day.

L90 Self-Driving or Under Pump
Enter the driving mechanism for the flow.

L100 Flowing Wellhead Pressure
Enter "A" for absolute pressure or "G" for gauge pressure in the last space of the units field. If unknown then leave blank. The number should conform to the numeric standards of the file (Appendix B in this manual).

L105 Temperature
Temperature at the wellhead. This number should conform to the numeric standards of the file. (Appendix B in this manual).

L110 Steam-Vapor Flow Rate

L120 Water-Liquid Flow Rate
The mass flow rates of liquid and steam phases. These numbers should conform to the numeric standards of the file (Appendix B in this manual).

L130 Enthalpy of Steam-Vapor

L140 Enthalpy of Water-Liquid
These numbers should conform to the numeric standards of the file (Appendix B in this manual).

L101 Mass Flow (Combined Phases)
The mass flow of the liquid and vapor phases together. This label can be ignored if labels L110 and L120 have been completed. This number should conform to the numeric standards of the file (Appendix B in this manual).

L102 Enthalpy (Combined Phases)
Enter this number when the enthalpy is measured on the unseparated liquid and vapor phases. This number should conform to the numeric standards of the file (Appendix B in this manual).

Intermediate-Flow Rate Measurements
Measurements recorded during restricted flow at the orifice.

L63 .Date
The date the measurements were made. Enter in format: Year/Month/Day

L64 Mass Discharge
This number should conform to the numeric standards of the file (Appendix B in this manual).

L65 Wellhead Pressure
Enter "A" for absolute pressure or "G" for gauge pressure in the last space of the units field. Leave the space blank, if unknown. This number should conform to the numeric standards of the file (Appendix B in this manual).

L66 Enthalpy
This number should conform to the numeric standards of the file (Appendix B in this manual).

L160 Comments (Performance)
Use to include additional information or to clarify or qualify information in the well performance section.

Primary Reference

K20 Author

K30 Date

K40 Title

K50 Reference
The most improtant reference used in completing this form.

K70-K80 Other References
This space is for any other references used to complete this form. This might include names of individuals who contributed information for certain labels of this form.

APPENDICES

A - COUNTRY CODES

CODE	COUNTRY NAME
IT	ITALY
IV	IVORY COAST
JM	JAMAICA
JN	JAN MAYEN
JA	JAPAN
JQ	JOHNSTON ATOLL
JO	JORDAN
KE	KENYA
KN	KOREA,NORTH
KS	KOREA,SOUTH
KU	KUWAIT
LA	LAOS
LE	LEBANON
LT	LESOTHO
LI	LIBERIA
LY	LIBYA
LS	LIECHTENSTEIN
LU	LUXEMBOURG
MC	MACAO
MA	MADAGASCAR
MI	MALAWI
MY	MALAYSIA
MV	MALDIVES
ML	MALI
MT	MALTA
MB	MARTINIQUE
MR	MAURITANIA
MP	MAURITIUS
MX	MEXICO
MQ	MIDWAY ISLANDS
MN	MONACO
MG	MONGOLIA
MH	MONTSERRAT
MO	MOROCCO
MZ	MOZAMBIQUE
MU	MUSCAT AND OMAN
NM	NAMIBIA
NR	NAURU
NP	NEPAL
NL	NETHERLANDS
NA	NETHERLANDS ANTILLES
NC	NEW CALEDONIA
NH	NEW HEBRIDES
NZ	NEW ZEALAND
NU	NICARAGUA
NG	NIGER
NI	NIGERIA
NE	NIUE
NF	NORFOLK ISLAND
NY	NORWAY

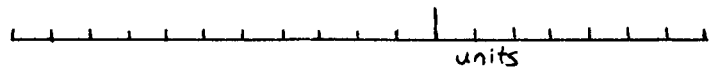
CODE	COUNTRY NAME
PK	PAKISTAN
PN	PANAMA
PP	PAPUA AND NEW GUINEA
PF	PARACEL ISLANDS
PA	PARAGUAY
PE	PERU
RP	PHILIPPINES
PC	PITCAIRN ISLAND
PL	POLAND
PO	PORTUGAL
PU	PORTUGUESE GUINEA
PT	PORTUGUESE TIMOR
RQ	PUERTO RICO
QA	QATAR
RE	REUNION
RO	ROMANIA
RW	RWANDA
YQ	RYUKYU ISLANDS,SOUTHERN
SM	SAN MARINO
TP	SAO TOME AND PRINCIPE
SA	SAUDI ARABIA
SG	SENEGAL
SE	SEYCHELLES
SL	SIERRA LEONE
SK	SIKKIM
SN	SINGAPORE
SO	SOMALIA
SF	SOUTH AFRICA
WA	SOUTH-WEST AFRICA
RH	SOUTHERN RHODESIA
YS	SOUTHERN YEMEN
UR	SOVIET UNION
SP	SPAIN
SS	SPANISH SAHARA
ME	SPANISH TERR. IN N. MOROCCO
PG	SPRATLY ISLAND
SC	ST. CHRISTOPHER-NEVIS-ANGUILLA
SH	ST. HELENA
ST	ST. LUCIA
SB	ST. PIERRE AND MIQUELON
VC	ST. VINCENT
SU	SUDAN
NS	SURINAM
SV	SVALBARD
SQ	SWAN ISLANDS
WZ	SWAZILAND
SW	SWEDEN
SZ	SWITZERLAND
SY	SYRIA
TZ	TANZANIA

A - COUNTRY CODES

CODE	COUNTRY NAME
TH	THAILAND
TO	TOGO
TL	TOKELAU ISLANDS
TN	TONGA
TD	TRINIDAD AND TOBAGO
TC	TRUCIAL STATES
TS	TUNISIA
TU	TURKEY
TK	TURKS AND CAICOS ISLANDS
UG	UGANDA
EG	UNITED ARAB REPUBLIC
UK	UNITED KINGDOM
US	UNITED STATES
UV	UPPER VOLTA
UY	URUGUAY
BQ	US MISC CARIBBEAN ISLANDS
IQ	US MISC PACIFIC ISLANDS
TQ	US TRUST ISLANDS, PACIFIC
VT	VATICAN CITY
VE	VENEZUELA
VN	VIET-NAM, NORTH
VS	VIET-NAM, SOUTH
VQ	VIRGIN ISLANDS
WQ	WAKE ISLAND
WF	WALLIS AND FUTUNA
WB	WEST BERLIN
GE	WEST GERMANY
WS	WESTERN SAMOA
YE	YEMEN
YO	YUGOSLAVIA
ZR	ZAIRE
ZA	ZAMBIA

B - Numeric Standards

Strict numeric standards are required for GEOTHERM. Space is provided for the number and associated units.



Every label with this format must conform to the following rules.

1) All numbers must be entered with a decimal point even if no decimal places are necessary. The number, "64," should be entered as "64.". This rule includes the fractional part of an exponential number.

2) All numbers must be left justified (i.e., they must line up against the left margin of the field). Units must be entered beginning with the marked character space.

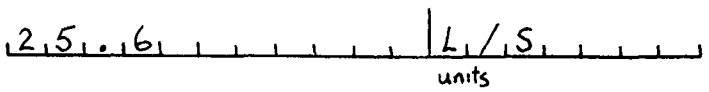
3) Exponents may be used in the format but must follow the E-format used in data processing. For example, the number 6.5×10^6, in E-format, would be 6.5E6. A number in exponential form must also conform to rules 1 and 2.

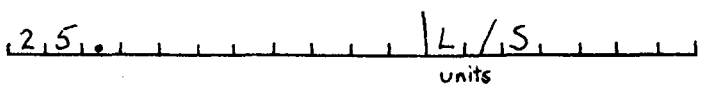
4) Certain characters may not be used in the numeric fields. The delimiters (< >) cannot be used for "Less Than" or "Greater Than" because they are characters reserved by the file system. Use "LT" and "GT" for "Less Than" and "Greater Than" respectively. Do not use the symbol (°) for degrees. Just enter C, F, or K for the temperature units.

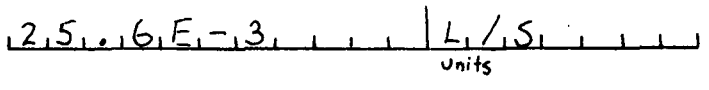
5) Ranges of numbers can be entered but are not recommended because calculations cannot be performed on the numbers. It is best to enter an average or best value where possible.

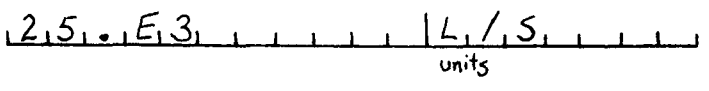
The numeric format does not restrict the possibility of entering text in the label. Remember, however, that the format is designed for calculations and the use of text in the field may render the contents useless for any mathematical manipulation.

Examples:









C - Suggested Unit Abbreviations

	UNITS	ABBREVIATION
PRESSURE	Pascal	PA
	Bars	BAR
	Atmosphere	ATM
	Kilogram/cm^2	KG/CM2
	Pounds/in^2	PSI
VOLUME	Liters	L
	Cubic meters	M**3
	Gallons	GAL
	Cubic kilometers	KM**3
AREA	Acres	ACRE
	Square mile	MI**2
	Square kilometer	KM**2
LINEAR	Meter	M
	Feet	FT
	Inches	IN
	Centimeter	CM
	Millimeter	MM
TIME	Hour	HR
	Minute	MIN
	Second	S
FLOW	Liters/minute	L/MIN
	Gallons/hour	GAL/HR
	Kilograms/second	KG/S
	Pounds/hour	LB/HR
HEAT	Joule	J
	Calorie	CAL
	Megawatt-hour	MWH

C (continued)

	UNITS	ABBREVIATION
HEAT FLUX	Calories/second	CAL/S
	BTU/hour	BTU/HR
	Joules/second	J/S
	Megawatts	MW
ENTHALPY	Joule/kilogram	J/KG
	BTU/pound	BTU/LB
TEMPERATURE	Centigrade	C
	Fahrenheit	F
	Kelvin	K

D - GEOTHERM Standard Units

Pressure	KG/CM2
Temperature	C
Mass flow	KG/S
Volume flow	L/S
Enthalpy	J/KG
Linear	M,KM
Area	KM**2
Volume	KM**3
Heat flux	J/S
Heat	J

NOTE: These standard units are not required by the reporter. Numbers in units other than the standard units will be converted upon entry to the file. The record will retain both the convered number and the submitted number.

E - EXAMPLES OF COMPLETED FORMS

Geothermal Resources File (GEOTHERM)
Revision 8 (February 1976)

Section A: Geothermal Field-Area (H1)

Record Identification

Record No. A10 < >

Cross Index No. A20 < >

Revision A25 < >

Record Type A30 < A >

Reporter

Name A50 < REED, M. J. >

Date A60 < 75/11 > (Yr./Mo.)

Organization A70 < U.S.G.S., MENLO PARK >

Geographic Locality

Name of Field-Area B10 < CERRO PRIETO >

Users of Area B13 < >

Waring Figure (USGS) B14 < >

Waring Number (USGS) B15 < >

Country Code (List A) B40 < MX >

Country Name B50 < MEXICO >

State/Province B60 < BAJA CALIFORNIA >

County B65 < >

Latitude B70 < 32-23-- N > (D M S N/S)

Longitude B80 < 115-15-- W > (D M S E/W)

Available Maps of Area B81 < >

Township, Range, Section, 1/4, 1/4

B95 < Township > B105 < Range > B115 < Section 1/4 1/4 >

Base & Meridian B125 < >

Other Locality Information B83 < >

General Description

Size of Surface Expression C10 < 12 KM**2 units >

Elevation B140 < 1 M units >

Resource Catagory C15 < _ >

Development Status C20 < _ >

Present Use & Developments C30 < ELECTRICAL GENERATION >

Potential Use C40 < FRESH WATER >

Inferred Heat Source C50 < PARTIAL CRUSTAL MELTING >

Depths to Production Zones

Zone 1 C70 < 800 M units >

Zone 2 C80 < 1000 M units >

Thickness of Production Zones

Zone 1 C100 < 100 M units >

Zone 2 C110 < 300 M units >

Average Temperature of Production Zones

Zone 1 C114 < units >

Zone 2 C115 < units >

Surface Thermal Activity C120 < MORE THAN 30 HOT SPRINGS 50-100 C WITHIN 40 KM**2 >

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Associated Deposits C130 < SILICA AND MUD VOLCANOES >

No. of Hot Springs C135 < 30 >

Electric Power Capacity C140 < 7.5 MW (units) >

Year Production Began C150 < _____ >

Number of Wells

Producing C170 < 15 >

Injection C180 < 0 >

Test C190 < 15 >

Abandoned C195 < _____ >

Other C200 < 6 >

Total No. of Wells C210 < 36 >

Principal Exploration Techniques C220 < DEEP DRILLING >

Comments (General Description) C230 < RESISTIVITY AND GEOCHEMISTRY USED AFTER DICOVERY >

Geothermal Characteristics

Main Reservoir Fluid E10 < WATER - 2% SODIUM CHLORIDE TYPE WATER >

Natural Surface Discharge E20 < 57,000 KG./HR. (units) >

E16 Measured E17 Estimated (Circle Label)

Total Calculated Discharge of Deep Water E15 < (units) >

Natural Recharge E30 < (units) >

Injection Recharge E40 < (units) >

Total Natural Heat Flux E50 < 3.0E10 CAL./HR. (units) >

Total Withdrawal Flux E60 < 6.7E10 CAL./HR. (units) >

Excess Withdrawal/Natural E70 < _____ >

Page 4 - Section A

Heat Flow of Surrounding Area E75 < units >

Range of Spring Temperatures E76 < units > to E77 < units >

Spring Description (if no temp. measured) E78 < Boiling Hot Warm > (Circle word)

Well information

Maximum Well Temperature E95 < units >

Depth Datum E96 < units >

Bottom-Hole Temperature E97 < units >

Depth Datum E98 < units >

Ave. Thermal Gradient E80 < 180 units C/KM >

Comments E90 < NO NATURAL RECHARGE CALCULATIONS >

Reservoir Properties

Reservoir Temperatures R15 < units >

to R20 < units >

R30 Assumed R40 Measured (Circled Label)

Best Estimate R50 < units >

Based on R55 < >

Subsurface Area R60 < units >

to R70 < units >

Best Estimate R100 < units >

Based on R110 < >

Depth to Reservoir Top R120 < units >

to R130 < units >

Best Estimate R140 < units >

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Depth to Reservoir Bottom	R145	< ____ units ____ >
to	R146	< ____ units ____ >
Best Estimate	R147	< ____ units ____ >
Reservoir Thickness	R150	< ____ units ____ >
to	R160	< ____ units ____ >
Best Estimate	R170	< ____ units ____ >
Reservoir Volume	R180	< ____ units ____ >
to	R190	< ____ units ____ >
Best Estimate	R200	< ____ units ____ >
Porosity	R210	< _____ > to R220 < _____ >
Best Estimate	R230	< _____ >
Ave. Well Flow (Mass)	R270	< ____ units ____ >
to	R280	< ____ units ____ >
Well Diameter	R290	< ____ units ____ >
Comments	R300	< _____ >

Reserves

Total Stored Heat	F13	< ____ units ____ >
to	F14	< ____ units ____ >
Best Estimate	F10	< ____ units ____ >
Depth Datum	F20	< ____ units ____ >
Temperature Datum	F30	< ____ units >
Recoverable Heat	F40	< ____ units ____ >
Depth Datum	F50	< ____ units ____ >
Temperature Datum	F60	< ____ units >

Method Used	F70	< >
Recoverable By-Product	F80	< >
Potential By-Product	F90	< >
Comments (Reserves):	F100	< NO RESERVE CALCULATIONS >

Geology

General Rock Types	G10	< QUATERNARY DELTA SEDIMENTS >
Cap Rock	G30	< >
Aquifer	G40	< PERMEABLE SANDSTONE AND FRACTURES >
Depth	G50	< 800 M units >
Thickness	G60	< 1,000 M units >
Cap Rock	G70	< >
Aquifer	G80	< PERMEABLE SANDSTONE AND FRACTURES >
Depth	G90	< 1,100 M units >
Thickness	G100	< 3,000 M units >
Other Horizons & Units	G20	< INTERBEDDED SHALE AND LIMESTONE >
Comments (Horizons):	G110	< GRANODIORITE BASEMENT DEEPER THAN 4 KM >
Hydrothermal Index Minerals	G120	< CHLORITE GT 145 C, WAIRAKITE GT 240 C >
Important Control or Locus	G140	< NW TRENDING FAULT ZONE >
Other Structures or Trends	G130	< >
Hydrology	G150	< RECHARGE FROM COLORADO RIVER, 80 KM AWAY >
Comments (Geology):	G160	< RAPIDLY SUBSIDING GRABEN FILLED BY COLORADO RIVER SEDIMENTS, QUATERNARY RHYODACITE DOME AND HOT SPRINGS ALONG FAULT ZONE. >

Geophysics

Gravity Survey Information	J20	< STEEP GRADIENT OFF SIERRA DE LOS CUCAPAS >
Magnetic Survey Information	J30	< REGIONAL GRADIENT >
Seismic Survey Information	J40	< FAULTED SEDIMENTS AND GRANODIORITE BASEMENT >
Electrical Resistivity	J50	< LOW RESISTIVITY ZONE OPEN TO THE EAST >
Other Geophysical Resistivity	J60	< >
Comments (Geophysics):	J70	< USED AFTER DRILLING OF MAIN WELLS TO PLAN EXPANSION OF FIELD >
Environmental Factors	H18	< EVAPORATION POND FOR WATER DISPOSAL, SILICA DEPOSITION IN CHANNELS, HYDROGEN SULPHIDE TO ATMOSPHERE >

Primary Reference (Geothermal Field)

Author	K20	< REED, MARSHALL J. >
Date	K30	< 1975 >
Title	K40	< GEOLOGY AND HYDROTHERMAL METAMORPHISM IN THE CERRO PRIETO FIELD >
Reference	K50	< U.N. GEOTHERMAL SYMPOSIUM, SAN FRANCISCO, JUNE, 1975 >

References

1)	K70	< MERRADO, S., 1968, SOC. QUIMICA MEX. QUIMICA PURA APLICADA >
2)	K80	< MERRADO, S., 1973, GEOTHERMICS, SPEC. ISSUE 2, V. 2, PART 2, P. 1367-1376 >
3)	K90	< ALONSO, H., 1966, BOL. SOC., GEOL., MEX., V. 29, P. 17-47 >
4)	K100	< >

Geothermal Resources File (GEOTHERM)
Revision 8 (February 1976)

Section B - Chemical Analysis (H2)

Record Identification

Record No. A10 < >

Cross Index No. A20 < >

Record Type A30 < B >

Sample Type A34 < (WELL) SURFACE > (Circle word)

Reporter

Name A50 < REED, M. J. >

Date A60 < 75 / 11 > (Yr. / Mo.)

Organization A70 < U. S. G. S. MENLO PARK >

Geographic Locality

Geothermal field B10 < CERRO PRIETO >

Name of Sample Source B20 < M-8 >

Country Code B40 < MX >

Country Name B50 < MEXICO >

State/Province B60 < BAJA CALIFOANIA >

County B65 < >

Latitude B70 < 32 (D) - 23 (M) N (N/S) >

Longitude B80 < 115 (D) - 15 (M) W (E/W) >

Township, Range, Section, 1/4, 1/4.

B95< > (Township) B105< > (Range) B115< > (Section, 1/4, 1/4)

USGS WRD Well-Spring Numbering System

B116 < >

Other Grid System

System Used B100 < >

X Coord. B110 < >

Y Coord. B120 < >

UTM Zone No. B130 < >

Map Reference B82 < >

Other Locality Information B83 < >

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Surface Sample Information

Source Type	S10	< >
Sample No.	M190	< >
Collection Date	M200	< >
Collector(s)	S20	< >
Point of Collection	N210	< >
Volume Flow Rate of Spring	M220	< units >
Temperature	M210	< units >
Qualitative Steam/Water Ratio	S40	< >
Deposits or Alteration	S30	< >
Water Treatment Data	M234	< >
Other Sample Information	S50	< >
References	M790	< >

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Well Sample Information

Sample No.	M190	< >
Collection Date	M200	< 74/02/22 >
Collector(s)	S20	< >
References	M790	< REED, M.J., 1975, U.N. GEOTHERMAL SYMPOSIUM >
Wellhead Status	N10	< FLOWING >
Wellhead Pressure	N30	< 7.9 BARS (units) A/G >
Water		
Point of Collection	P55	< SILENCER OUTLET >
Separation Pressures		
First	P60	< 7.9 BARS (units) A/G >
Second	P70	< 7.84 BARS (units) A/G >
Third	P80	< (units) A/G >
Water Sampling Temp.	M210	< (units) >
Steam		
Point of Collection	P75	< >
Separation pressure	P65	< (units) A/G >
Steam Sampling Temp.	S60	< (units) >
Steam Flow Rate (Mass)	N50	< (units) >
Water Flow Rate (Mass)	M220	< (units) >
Enthalpy of Total Flow	N60	< (units) >
Water Treatment Data	M234	< >
		>
Other sample information	S50	< >

Water Analysis A31 < W >

Analysis Date M233 <_____>

Analyst(s) M236 <_____>

pH 1) M20 <8.3> At M20A <25 Temp. C units>

2) M202 < > At M202A < Temp. units>

Eh M221 < units>

Temperature M222 < units>

Specific Gravity M91 <_____>

Specific Conductance M21 < units>

Temperature M740 < units>

Alkalinity M22 < units>

Total Dissolved Solids M23 < units>

Total Suspended Solids M24 < units>

Isotopic Data

Del O (18) of Water Q270 < units>

Del D of Water Q250 < units>

Del C (13) of Dissolved CO_2 Q150 < units>

Del O (18) of Dissolved SO_4 Q200 < units>

Del S (34) of Dissolved SO_4 Q190 < units>

Del S (34) of Dissolved H_2S Q185 < units>

Tritium Content of Water Q186 < units>

C(14) Content of CO_2 Q187 < units>

Other Q310 <_____>

Page 5 - Section B

Solute Analysis (Water)

Units Used M341 < PPM >

Li	M30	< 18.5 >	Mg	M70	< 0.4 >	Cu	M360	< >	F	M90	< >
Na	M40	< 8000 >	Ca	M60	< 460 >	Zn	M390	< >	Cl	M80	< 15300 >
K	M50	< 2000 >	Sr	M380	< >	Hg	M440	< >	Br	M350	< >
Rb	M480	< >	Ba	M330	< >	B	M120	< 20 >	I	M490	< >
Cs	M500	< >	Ca+Mg	M180	< >	HBO_2	M170	< >	O_2	M610	< >
Na+K	M300	< >	Mn+3	M630	< >	Al	M310	< >	N_2	M530	< >
NH_4	M150	< >	Mn(TOT)	M520	< >	Pb	M370	< >	CO_2	M570	< >
NO_3	M590	< >	Fe+3	M620	< >	As	M320	< >	SO_2	M540	< >
PO_4	M600	< >	Fe(TOT)	M510	< >	Sb	M470	< >	H_2S	M160	< >
SiO_2	M130	< 1000 >				U	M450	< >	H_2	M550	< >
SO_4	M110	< 15 >							CH_4	M560	< >
CO_3	M580	< >									
HCO_3	M140	< 65 >									

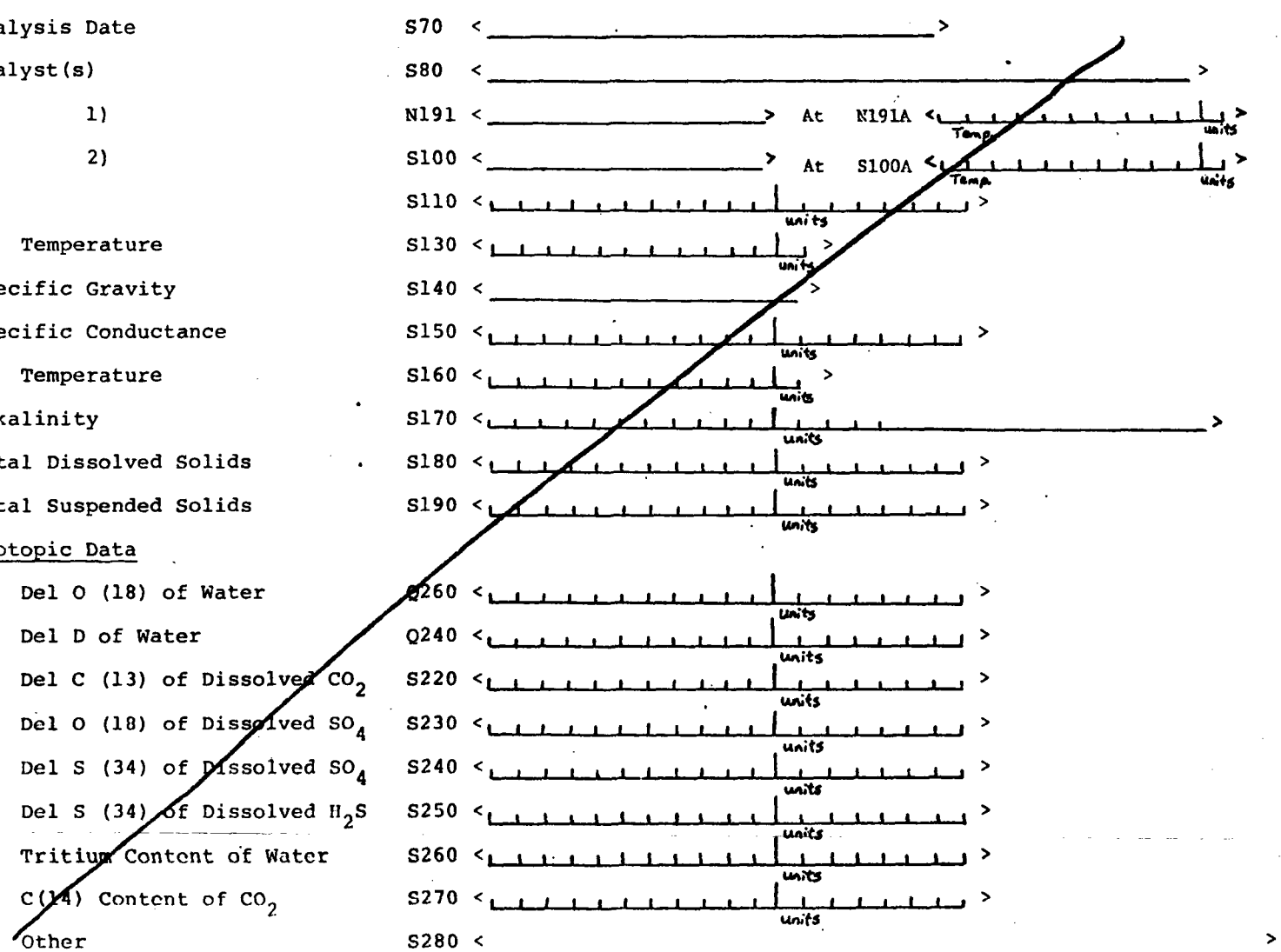
Rare Earths Analyzed M750 < >

Actinides Analyzed M760 < >

Rare Gases Analyzed M770 < >

Other Solutes & Gases M780 < >

Comments M800 < >


Condensate Analysis
A32 < C >
Analysis Date
S70 <
Analyst(s)
S80 <
pH 1)
N191 <
At N191A <
Temp
units
2)
S100 <
At S100A <
Temp
units
Eh
S110 <
units
Temperature
S130 <
units
Specific Gravity
S140 <
Specific Conductance
S150 <
units
Temperature
S160 <
units
Alkalinity
S170 <
units
Total Dissolved Solids
S180 <
units
Total Suspended Solids
S190 <
units
Isotopic Data
Del O (18) of Water
Q260 <
units
Del D of Water
Q240 <
units
Del C (13) of Dissolved CO2
S220 <
units
Del O (18) of Dissolved SO4
S230 <
units
Del S (34) of Dissolved SO4
S240 <
units
Del S (34) of Dissolved H2S
S250 <
units
Tritium Content of Water
S260 <
units
C(14) Content of CO2
S270 <
units
Other
S280 <

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Solute Analysis (Condensate)

Units Used T500 <_____>

Li	T10	Mg	T140	Cu	T230	F	T330				
Na	T20	Ca	T150	Zn	T240	Cl	T340				
K	T30	Sr	T160	Hg	T250	Br	T350				
Rb	T40	Ba	T170	B	T260	I	T360				
Cs	T50	Ca+Mg	T180	HBO_2	T270	O_2	T370				
Na+K	T60	Mn+3	T190	Al	T280	N_2	T380				
NH_4	T70	Mn(TOT)	T200	Pb	T290	CO_2	T390				
NO_3	T80	Fe+3	T210	As	T300	SO_2	T400				
PO_4	T90	Fe(TOT)	T220	Sb	T310	H_2S	T410				
SiO_2	T100			U	T320	H_2	T420				
SO_4	T110					CH_4	T430				
CO_3	T120										
HCO_3	T130										

Rare Earths Analyzed T440 <_____>

Actinides Analyzed T450 <_____>

Rare Gases Analyzed T460 <_____>

Other Solutes & Gases T470 <_____>

_____>

Comments T490 <_____

_____>

Gas Analysis A33 < G >

Analysis Date U10 <_____>

Analyst(s) U20 <_____>

Gas/H_2O Ratio (mol/mol) U30 <_____>

Units Used N230 <_____>

CO_2	N80 <_____>		H_2	N120 <_____>		Ar	N183 <_____>	
H_2S	N90 <_____>		CH_4	N130 <_____>		Rn	N110 <_____>	
N_2	N140 <_____>		C_2H_6	N182 <_____>		Hg	N160 <_____>	
O_2	N150 <_____>		He	N170 <_____>				

Other Hydrocarbons U40 <_____>

Other U50 <_____>

Isotopic Data

Del C (13) of CO_2 U60 <_____ units>

C(14) Content of CO_2 U70 <_____ units>

Del C (13) of CH_4 Q170 <_____ units>

Del D of CH_4 U90 <_____ units>

Del D of H_2 Q220 <_____ units>

Del S (34) of H_2S U110 <_____ units>

Ratio Ar(40)/Ar(36) Q290 <_____>

Other U130 <_____>

Comments U140 <_____>

GEOTHERMAL RESOURCES FILE (GEOTHERM)
Revision 8 (February 1976)

Section C - Geothermal Well/Drillhole (H3)

Record Identification

Record No. A10 < >

Cross Index No. A20 < >

Record Type A30 < C >

Reporter

Name A50 < REED, M. J. >

Date A60 < 75/11 > (Yr./Mo.)

Organization A70 < U. S. G. S. MENLO PARK >

Geographic Locality

Geothermal Field B10 < CERRO PRIETO >

Well Name or No. B30 < M-5 >

Drilled By B35 < >

Country Code B40 < MX >

Country Name B50 < MEXICO >

State/Province B60 < BAJA CALIFORNIA >

County B65 < >

Latitude B70 < 32-23 N/S > (D, M)

Longitude B80 < 115-15 E/W > (D, M)

Township, Range, Section, 1/4, 1/4

B95 < > (Township) B105 < > (Range) B115 < > (Section, 1/4, 1/4)

USGS WRD Well-Spring Numbing System

B116 < >

Other Grid System

System Used B100 < TRANSVERSE MERCATOR GRID ZONE H >

X Coord. B110 < 664900. ME >

Y Coord. B120 < 3586250. MN >

UTM Zone No. B130 < >

Map Reference B82 < >

Other Locality Information B83 < >

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General Description

Type of Well	D10	< PRODUCTION >
Date Drilling Began	D11	< >
Completion Date	D12	< >
Date Abandoned	D13	< >
Depth of Hole	D20	< 1298.2 M units >
Water Level	D25	< units >
Production Casing: Length	D40	< 1066. M units >
Diameter	D50	< 10.66. M units >
Wellhead Elevation	B150	< 117.8 MM units >
Steam Production Method	D60	< SEPARATION FROM WATER >
Comments (General Description)	C230	< PRODUCING ZONE = 1097 TO 1298 M, SLOTTED LINER ACROSS PRODUCING ZONE >

Well Performance

Shutin Measurements

Date	L20	< >
Downhole Pressure	L30	< units N/G >
Downhole Temperature	L40	< units >
Depth of Measurements	L50	< units >
Wellhead Pressure	L60	< units N/G >

High Flow Rate Measurements

Date	L80	< 75/01/30 >
Self-Driving or Under Pump	L90	< SELF DRIVING >
Flowing Wellhead Pressure	L100	< 7.49 BARS units N/G >
Temperature	L105	< units >

Section C - Page 3

Steam-Vapor Flow Rate (Mass)	L110	65500 KG/HR
Water-Liquid Flow Rate (Mass)	L120	168000 KG/HR
Enthalpy of Steam-Vapor	L130	660 CAL/G
Enthalpy of Water-Liquid	L140	169 CAL/G
Mass Flow (Combined Phases)	L101	233500 KG/HR
Enthalpy (Combined Phases)	L102	306 CAL/G

Intermediate Flow Rate Measurements

Date	L63	
Mass Discharge	L64	units
Wellhead Pressure	L65	units A/C
Enthalpy	L66	units

Comments (Performance): L160 <

Primary Reference

Author K20 < REED, MARSHALL J

Date K30 < 1975

Title K40 < GEOLOGY AND HYDROTHERMAL METAMORPHISM IN THE CERRO PRIETO FIELD>

Reference K50 < U.N. GEOTHERMAL SYMPOSIUM, SAN FRANCISCO, JUNE, 1975>

Other References

1) K70 < CERRO PRIETO, PLANTA GEOTEMOELECTRICA, JUNE, 1973>

2) K80 <

F - INDEX OF GEOTHERM LABELS

Input data items (labels) are indexed by page number in this manual and by form-page on the input forms. All labels are listed except the individual chemical solute items on pages 5, 7 and 8 of Section B.

Label	Page in manual	Form-Page
A10	29, 63, 95	A-1, B-1, C-1
A20	29, 63, 95	A-1, B-1, C-1
A25	29	A-1
A30	29, 63, 95	A-1, A-2, A-3
A31	72	B-4
A32	76	B-6
A33	81	B-8
A34	63	B-1
A50	29, 63, 95	A-1, B-1, C-1
A60	29, 63, 95	A-1, B-1, C-1
A70	29, 63, 95	A-1, B-1, C-1
B10	30, 64, 95	A-1, B-1, C-1
B13	30	A-1
B14	30	A-1
B15	30	A-1
B20	64	B-1
B30	96	C-1
B35	96	C-1
B40	30, 64, 96	A-1, B-1, C-1
B50	30, 64, 96	A-1, B-1, C-1
B60	30, 64, 96	A-1, B-1, C-1
B65	30, 64, 96	A-1, B-1, C-1
B70	30, 64, 96	A-1, B-1, C-1
B80	30, 64, 96	A-1, B-1, C-1
B81	31	A-1
B82	66, 98	B-1, C-1
B83	31, 66, 98	A-2, B-1, C-1
B95	31, 65, 97	A-2, B-1, C-1
B100	66, 98	B-1, C-1
B105	31, 65, 97	A-2, B-1, C-1
B110	66, 98	B-1, C-1
B115	31, 65, 97	A-2, B-1, C-1
B116	65, 97	B-1, C-1
B120	66, 98	B-1, C-1,
B125	31	A-2
B130	66, 98	B-1, C-1
B140	32	A-2

Label	Page in manual	Form-Page
C10	31	A-2
C15	32	A-2
C20	32	A-2
C30	33	A-2
C40	33	A-2
C50	33	A-2
C70	33	A-2
C80	33	A-2
C100	33	A-2
C110	33	A-2
C114	33	A-2
C115	33	A-2
C120	33	A-2
C130	33	A-3
C135	33	A-3
C140	33	A-3
C150	33	A-3
C170	33	A-3
C180	33	A-3
C190	33	A-3
C195	33	A-3
C200	33	A-3
C210	33	A-3
C220	33	A-3
C230	34, 99	A-3, C-2
D10	99	C-2
D11	99	C-2
D12	99	C-2
D13	99	C-2
D20	99	C-2
D25	99	C-2
D40	99	C-2
D50	99	C-2
D60	99	C-2
E10	34	A-3
E15	34	A-3
E16	34	A-3
E17	34	A-3
E20	34	A-3
E30	34	A-3
E40	34	A-3
E50	34	A-3
E60	35	A-3
E70	35	A-3

Label	Page in manual	Form-Page
E75	35	A-4
E76	35	A-4
E77	35	A-4
E78	35	A-4
E80	36	A-4
E90	36	A-4
E95	35	A-4
E96	35	A-4
E97	35	A-4
E98	35	A-4
F10	38	A-5
F13	38	A-5
F14	38	A-5
F20	38	A-5
F30	38	A-5
F40	38	A-5
F50	38	A-5
F60	38	A-5
F70	38	A-6
F80	38	A-6
F90	38	A-6
F100	38	A-6
G10	39	A-6
G20	39	A-6
G30	39	A-6
G40	39	A-6
G50	39	A-6
G60	39	A-6
G70	39	A-6
G80	39	A-6
G90	39	A-6
G100	39	A-6
G110	39	A-6
G120	39	A-6
G130	39	A-6
G140	39	A-6
G150	39	A-6
G160	40	A-6
H18	40	A-7
J20	40	A-7
J30	40	A-7
J40	40	A-7
J50	40	A-7
J60	40	A-7
J70	40	A-7

Label	Page in manual	Form-Page
K20	40, 102	A-7, C-3
K30	40, 102	A-7, C-3
K40	40, 102	A-7, C-3
K50	40, 102	A-7, C-3
K70	40, 102	A-7, C-3
K80	40, 102	A-7, C-3
K90	40	A-7
K100	40	A-7
L20	100	C-2
L30	100	C-2
L40	100	C-2
L50	100	C-2
L60	100	C-2
L63	101	C-3
L64	102	C-3
L65	102	C-3
L66	102	C-3
L80	100	C-2
L90	100	C-2
L100	101	C-2
L101	101	C-3
L102	101	C-3
L105	101	C-3
L110	101	C-3
L120	101	C-3
L130	101	C-3
L140	101	C-3
L160	102	C-3
M20	72	B-4
M20A	72	B-4
M21	73	B-4
M22	73	B-4
M23	73	B-4
M24	73	B-4
M91	72	B-4
M190	67, 69	B-2, B-3
M200	67, 69	B-2, B-3
M202	72	B-4
M202A	72	B-4
M210	67, 70	B-2, B-3
M220	67, 70	B-2, B-3
M221	72	B-4
M222	72	B-4
M233	72	B-4
M234	67, 71	B-2, B-3
M236	72	B-4

Label	Page in manual	Form-Page
M341	75	B-5
M740	73	B-4
M750	75	B-5
M760	75	B-5
M770	75	B-5
M780	75	B-5
M790	68, 69	B-2, B-3
M800	75	B-5
N10	69	B-3
N30	69	B-3
N50	70	B-3
N60	71	B-3
N191	76	B-6
N191A	76	B-6
N210	67	B-2
N230	81	B-8
P55	69	B-3
P60	69	B-3
P65	70	B-3
P70	69	B-3
P75	70	B-3
P80	69	B-4
Q150	73	B-8
Q170	82	B-4
Q185	73	B-4
Q186	74	B-4
Q187	74	B-4
Q190	73	B-4
Q200	73	B-4
Q220	82	B-8
Q240	77	B-6
Q250	73	B-4
Q260	77	B-6
Q270	73	B-4
Q290	82	B-8
Q310	74	B-4
R15	36	A-4
R20	36	A-4
R30	36	A-4
R40	36	A-4
R50	36	A-4
R55	36	A-4
R60	36	A-4
R70	36	A-4

Label	Page in manual	Form-Page
R100	37	A-4
R110	37	A-4
R120	37	A-4
R130	37	A-4
R140	37	A-4
R145	37	A-5
R146	37	A-5
R147	37	A-5
R150	37	A-5
R160	37	A-5
R170	37	A-5
R180	37	A-5
R190	37	A-5
R200	37	A-5
R210	37	A-5
R220	37	A-5
R230	37	A-5
R270	37	A-5
R280	37	A-5
R290	37	A-5
R300	37	A-5
S10	67	B-2, B-3
S20	67, 69	B-2
S30	67	B-2
S40	67	B-2, B-3
S50	68, 71	B-3
S60	70	B-6
S70	76	B-6
S80	76	B-6
S100	76	B-6
S100A	76	B-6
S110	76	B-6
S130	76	B-6
S140	76	B-6
S150	77	B-6
S160	77	B-6
S170	77	B-6
S180	77	B-6
S190	77	B-6
S220	77	B-6
S230	77	B-6
S240	77	B-6
S250	77	B-6
S260	78	B-6
S270	78	B-6
S280	78	B-6

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U10	81	B-8
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U50	81	B-8
U60	82	B-8
U70	82	B-8
U90	82	B-8
U110	82	B-8
U130	82	B-8
U140	82	B-8

GPO 910-882

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Office of Resource Analysis
345 Middlefield Road
Menlo Park, California 94025

November 7, 1979

Duncan Foley
Earth Science of Utah Research Institute
420 Chipeta Way, Suite 120
Salt Lake City, Utah 84108

Dear Duncan,

I'm sending you summary sheets on the contributions to GEOTHERM from each state. These have also been sent out to each state. I thought that you might be interested in the results. I'm also adding comments where appropriate.

I have not received any data from New Mexico except from Chaturedi. I know that Chandler has quite a bit of data and I am a little concerned that the data entry portion of the contract will go unfulfilled. Could you contact Chandler and see what plans he has for sending data to GEOTHERM? Also, it is important that I be contacted before data are sent on tape or in some other form for which we may not be adequately prepared.

You will notice that there is not an enclosed sheet for Arizona. I prepared them after my phone conversation with Dick Hahman. I figured that he would not care to see anything from me for a while. We do have over 200 records from Arizona.

Sincerely,

James R. Swanson

Enclosures

STATE: Alaska

No. State-submitted Records: 55

No. Records already in GEOTHERM: 28

Total no. Alaska records in GEOTHERM: 83

State Data:	Springs	14
	Wells	41
Other:	Springs	27
	Wells	1

Received some others but they are not on the file. Some of the localities are really strange, 5°C with high flow. They consider that a resource. I'm sure that I do not have all the published information on thermal (much greater than 5°C) springs.

STATE: California

No. State-submitted Records: 613

No. Records already in GEOTHERM: 821

Total no. California records in GEOTHERM: 1434

	State Data		Other	
County	No. Wells	No. Springs	No. Wells	No. Springs
Alameda	-	1	-	18
Alpine	-	1	-	3
Butte	-	-	-	2
Calaveras	-	1	-	-
Colusa	-	7	3	44
Contra Costa	-	2	2	19
Del Norte	-	-	-	1
El Dorado	-	1	-	4
Fresno	-	7	1	21
Glenn	-	-	-	7
Imperial	138	16	9	9
Inyo	4	16	4	37
Kern	4	7	2	10
Kings	-	-	2	3
Lake	4	22	6	93
Lassen	7	11	1	8
Los Angeles	3	4	1	13
Madera	-	2	-	1
Marin	-	1	-	-
Mariposa	-	-	-	5
Mendocino	1	6	1	12
Merced	-	1	1	5
Modoc	13	24	4	18
Mono	10	24	2	30
Monterey	-	7	1	32
Napa	17	6	2	17

STATE: California (continued)

No. State-submitted Records: _____

No. Records already in GEOTHERM: _____

Total no. _____ records in GEOTHERM: _____

	State Data		Other	
County	No. Wells	No. Springs	No. Wells	No. Springs
Orange	6	1	2	1
Placer	-	1	-	1
Plumas	8	9	5	4
Riverside	91	8	9	32
San Benito	1	-	6	6
San Bernadino	19	12	5	38
San Diego	23	4	2	22
San Joaquin	-	-	-	2
San Luis Obispo	5	5	7	12
San Mateo	-	-	-	2
Santa Barbara	-	6	-	28
Santa Clara	-	3	3	12
Santa Cruz	-	-	5	7
Shasta	-	4	4	22
Sierra	2	1	-	-
Siskiyou	-	5	1	22
Solano	-	-	-	3
Sonoma	2	12	4	24
Stanislaus	-	-	-	17
Tehama	-	5	-	14
Trinity	-	-	2	9
Tulare	-	4	-	8
Ventura	-	6	1	20

We are expecting more chemistry but haven't any. What we have now is the same as late summer 1978

STATE: Colorado

No. State-submitted Records: 191

No. Records already in GEOTHERM: 58

Total no. Colorado records in GEOTHERM: 249

	State Data		Other	
County	No. Wells	No. Springs	No. Wells	No. Springs
Alamosa	-	-	2	-
Archuleta	2	4	3	1
Boulder	1	4	-	-
Chaffee	3	25	4	11
Clear Creek	-	4	1	3
Conejos	-	2	-	-
Delta	1	-	-	-
Dolores	-	8	1	4
Eagle	-	4	-	-
Fremont	2	8	-	-
Garfield	-	20	-	1
Grand	-	8	-	-
Gunnison	-	20	-	9
Jackson	1	-	-	-
La Plata	-	8	-	2
Mineral	-	9	-	3
Moffat	1	4	-	-
Ouray	-	9	-	2
Park	-	7	-	-
Pitkin	-	3	-	3
Pueblo	1	-	-	-
Routt	-	8	-	4
Saguache	-	22	-	3
San Miguel	-	2	-	1

STATE: Hawaii

No. State-submitted Records: 288

No. Records already in GEOTHERM: -

Total no. Hawaii records in GEOTHERM: 288

	State Data		Other	
County	No. Wells	No. Tunnels	No. Wells	No. Springs
Hawaii	72	7		
Kauai	48	15		
Maui	27	23		
Molokai	6	1		
Oahu	84	5		

STATE: Idaho

No. State-submitted Records: 31

No. Records already in GEOTHERM: 63

Total no. Idaho records in GEOTHERM: 94

	State Data		Other	
County	No. Wells	No. Springs	No. Wells	No. Springs
Ada	6	-	-	1
Adams	-	1	1	4
Bannock	-	1	-	-
Bingham	1	-	-	-
Blaine	-	1	-	3
Boise	1	-	-	4
Bonneville	-	1	-	-
Butte	-	-	1	-
Camas	-	2	1	4
Canyon	4	-	-	-
Caribou	-	1	-	-
Cassia	1	-	1	2
Clark	1	-	-	-
Custer	-	-	-	3
Elmore	1	1	4	4
Franklin	1	-	1	2
Fremont	-	-	1	1
Gem	-	-	-	1
Gooding	-	-	2	1
Idaho	-	2	-	3
Lemhi	-	-	-	2
Owyhee	-	-	-	2
Twin Falls	2	-	1	1
Valley	-	3	-	5
Washington	-	-	1	6

Received a large batch with many errors. Talked to John Mitchell and he said they would check them out. No problem with that situation.

STATE: Montana

No. State-submitted Records: 74

No. Records already in GEOTHERM: 8

Total no. Montana records in GEOTHERM: 82

	State Data		Other	
County	No. Wells	No. Springs	No. Wells	No. Springs
Beaverhead	-	10	-	-
Blaine	-	1	-	-
Broadwater	-	5	-	-
Cascade	-	1	-	-
Deer Lodge	-	3	-	-
Fergus	-	2	-	-
Gallatin	-	3	-	-
Granite	-	3	-	-
Jefferson	-	3	-	2
Lake	1	-	-	-
Lewis and Clark	1	2	-	-
Madison	-	12	-	1
Meagher	2	1	-	-
Missoula	-	3	-	-
Park	-	4	-	3
Phillips	-	4	-	-
Powell	-	3	-	-
Ravalli	-	5	-	1
Sanders	1	3	-	-
Silver Bow	-	-	-	1
Sweet grass	-	1	-	-

STATE: Nevada

No. State-submitted Records: 1010

No. Records already in GEOTHERM: 321

Total no. Nevada records in GEOTHERM: 1331

	State Data		Other	
County	No. Wells	No. Springs	No. Wells	No. Springs
Carson City	4	4	-	-
Churchill	23	4	4	11
Clark	62	24	-	1
Douglas	1	7	-	5
Elko	9	34	-	24
Esmeralda	8	9	-	3
Eureka	11	31	3	23
Humboldt	24	55	6	18
Lander	9	23	4	16
Linclon	10	27	-	3
Lyon	18	6	2	5
Mineral	12	6	2	2
Nye	104	167	2	22
Pershing	9	30	-	15
Storey	-	-	-	1
Washoe	180	66	34	103
White Pine	5	23	-	10

STATE: New Mexico

No. State-submitted Records: 310

No. Records already in GEOTHERM: 58

Total no. New Mexico records in GEOTHERM: 368

	State Data		Other	
County	No. Wells	No. Springs	No. Wells	No. Springs
Catron	2	-	1	2
Colfax	4	-	1	-
Dona Ana	1	-	1	-
Grant	1	-	-	3
Guadalupe	6	-	-	-
Harding	19	-	1	-
Hidalgo	3	-	-	1
Luna	1	-	-	-
McKinley	46	-	7	-
Mora	9	-	-	-
Ouay	5	-	-	-
Rio Arriba	52	-	13	-
Roosevelt	2	-	-	-
San Juan	86	-	16	-
San Miguel	4	-	-	-
Sandoval	44	-	2	4
Santa Fe	2	-	-	-
Socorro	1	-	-	-
Torrance	2	-	-	-
Union	11	-	-	-
Valencia	3	-	-	-

all from Lokesh Chaturvedi. I don't know if this set is worth keeping

STATE: Oregon

No. State-submitted Records: 47

No. Records already in GEOTHERM: 142

Total no. Oregon records in GEOTHERM: 189

County	State Date No. Wells	State Date No. Spgs.	Other No. Wells	Other Fumeroles	Other No. Sprgs.
Baker	-	3	1	-	1
Clackamas	1	2	-	9	3
Deschutes	-	-	1	-	5
Douglas	-	1	-	-	1
Grant	-	1	-	-	3
Harney	6	6	1	-	27
Jackson	-	1	-	-	-
Klamath	5	1	42	-	6
Lake	-	-	2	-	13
Lane	-	5	-	-	6
Malheur	3	4	-	-	11
Marion	1	-	-	-	1
Multnomah	1	1	-	-	-
Umatilla	-	1	-	-	1
Union	-	1	4	-	3
Wallowa	-	1	-	-	-
Wasco	2	-	-	-	1

STATE: Texas

No. State-submitted Records: 0

No. Records already in GEOTHERM: 29

Total no. Texas records in GEOTHERM: 29

19 Springs

10 Wells

STATE: Utah

No. State-submitted Records: 650

No. Records already in GEOTHERM: 14

Total no. Utah records in GEOTHERM: 664

	State Data		Other	
County	No. Wells	No. Springs	No. Wells	No. Springs
Beaver	23	25	-	3
Box Elder	23	45	-	-
Cache	26	1	-	-
Davis	35	7	-	1
Duchesne	-	1	-	-
Emery	1	-	-	-
Garfield	2	12	-	-
Iron	9	1	-	-
Juab	-	3	-	2
Millard	41	35	-	2
Morgan	-	2	-	-
Salt Lake	69	24	-	1
San Juan	4	10	-	-
Sanpete	1	3	-	-
Sevier	3	17	-	4
Summit	-	1	-	-
Tooele	26	28	-	-
Uintah	35	2	-	-
Utah	34	30	-	-
Wasatch	-	11	-	-
Washington	12	17	-	1
Wayne	1	1	-	-
Weber	16	9	-	-

STATE: Washington

No. Battelle-submitted Records: 202

No. Records already in GEOTHERM: 10

Total no. Washington records in GEOTHERM: 212

	State Data		Other	
County	No. Wells	No. Springs	No. Wells	No. Springs
Adams	42	-	-	-
Asotin	1	-	-	-
Benton	15	-	-	-
Clallam	-	-	-	2
Columbia	1	-	-	-
Douglas	6	-	-	-
Franklin	6	-	-	-
Grant	36	-	-	-
Kittitas	3	-	-	-
Klickitat	10	-	-	-
Lewis	-	-	-	2
Lincoln	17	-	-	-
Pierce	-	-	-	1
Snohomish	-	-	-	4
Spokane	2	-	-	-
Stevens	1	-	-	-
Walla Walla	11	-	-	-
Whatcom	-	-	-	1
Whitman	2	-	-	-
Yakima	49	-	-	-

all from Battelle. This data set is probably not worth keeping.

STATE: Wyoming

No. State-submitted Records: 78

No. Records already in GEOTHERM: 1

Total no. Wyoming records in GEOTHERM: 79

	State Data		Other	
County	No. Wells	No. Springs	No. Wells	No. Springs
Big Horn	-	2	-	-
Carbon	-	5	-	-
Converse	-	1	-	-
Fremont	-	12	-	-
Hot Springs	5	13	-	-
Lincoln	-	5	-	1
Natrona	-	3	-	-
Park	-	9	-	-
Platte	-	2	-	-
Sublette	-	6	-	-
Teton	-	15	-	-

→ to Judy for your files M

KNOWN GEOTHERMAL RESOURCES AREAS (KGRA'S)
AS CLASSIFIED BY THE INDICATED AREA GEOLOGISTS
WESTERN AND CENTRAL REGIONS
(as of October 2, 1978)

WESTERN REGION

Alaska Area Geologist, Anchorage, Alaska

Alaska	No. of Acres
1. Geyser Spring Basin	20,960
2. Okmok Caldera	44,800
3. Pilgrim Springs	22,400
	88,160

Pacific Area Geologist, Menlo Park, California

Arizona	
1. Clifton	780
2. Gillard Hot Springs	2,920
	3,700

California	
1. Beckwourth Peak	2,558
2. Bodie	640
3. Brawley	28,886
4. Coso Hot Springs	106,798
5. Dunes	7,680
6. East Mesa	38,365
7. Ford Dry Lake	7,687
8. Geysers-Calistoga	376,030
9. Glamis	25,505
10. Glass Mountain	33,287
11. Heber	58,568
12. Knoxville	14,702
13. Lake City-Surprise Valley	72,940
14. Lassen Hot Springs	78,642
15. Little Horse Mountain	1,196
16. Love Lady Ridge	6,879
17. Mono-Long Valley	460,256
18. Randsburg	12,880
19. Saline Valley	3,200
20. Salton Sea	95,824
21. Sespe Hot Springs	7,034
22. Wendel-Amedee	17,932
23. Witter Springs	18,152
	1,475,641

Idaho		No. of Acres
1.	Bruneau	5,120
2.	Castle Creek	79,722
3.	Crane Creek	4,342
4.	Island Park	28,539
5.	Mountain Home	9,520
6.	Raft River	30,209
7.	Vulcan Hot Springs	3,836
8.	Yellowstone	14,164
9.	Conda	2,566
		178,018

Nevada		
1.	Baltazor	5,617
2.	Beowawe	33,224
3.	Brady-Hazen	98,508
4.	Colado	640
5.	Darrough Hot Springs	8,363
6.	Dixie Valley	38,348
7.	Double Hot Springs	29,326
8.	Elko Hot Springs	8,960
9.	Fly Ranch	20,759
10.	Fly Ranch Northeast	7,680
11.	Gerlach	26,326
12.	Gerlach Northeast	7,971
13.	Hot Springs Point	8,549
14.	Kyle Hot Springs	2,561
15.	Leach Hot Springs	12,846
16.	Moana Springs	5,120
17.	Monte Neva Hot Springs	10,302
18.	Pinto Hot Springs	8,015
19.	Ruby Valley	5,743
20.	Rye Patch	801
21.	Salt Wells Basin	19,232
22.	San Emidio Desert	7,678
23.	Silver Peak	5,117
24.	Soldier Meadow	5,966
25.	Steamboat Springs	8,911
26.	Stillwater-Soda Lake	225,260
27.	Trego	7,013
28.	Wabuska	11,520
29.	Warm Springs	3,812
30.	Wilson Hot Springs	1,294
		635,462

Oregon		No. of Acres
1.	Alvord	176,835
2.	Belknap-Foley Hot Springs	5,066
3.	Breitenbush Hot Springs	13,445
4.	Burns Butte	640
5.	Carey Hot Springs	7,579
6.	Crump Geyser	85,663
7.	Klamath Falls	50,300
8.	Lakeview	12,165
9.	McCredie Hot Springs	3,659
10.	Mount Hood	8,671
11.	Newberry Crater	31,284
12.	Vale Hot Springs	22,998
13.	Summer Lake Hot Springs	13,631
		431,936

Washington		
1.	Indian Heaven	2,547
2.	Kennedy Hot Springs	3,311
3.	Mount St. Helens	29,754
		35,612

CENTRAL REGION

Central Rocky Mountain Area Geologist, Denver, Colorado

Colorado		
1.	Alamosa County	6,761
2.	Mineral Hot Springs	5,765
3.	Poncha	3,200
4.	Valley View Hot Springs	5,099
		20,825

Utah		
1.	Cove Fort-Sulphurdale	24,074
2.	Crater Springs	17,321
3.	Lund	3,840
4.	Meadow-Hatton	1,927
5.	Monroe-Joseph	16,364
6.	Navajo Lake	2,522
7.	Newcastle	2,636
8.	Roosevelt Hot Springs	29,791
9.	Thermo Hot Springs	26,019
		124,594

Northern Rocky Mountain Area Geologist, Casper, Wyoming

Montana		No. of Acres
1.	Boulder Hot Springs	6,343
2.	Corwin Springs	20,349
3.	Marysville	19,200
4.	Yellowstone	12,763
		58,655

Southern Rocky Mountain Area Geologist, Roswell, New Mexico

New Mexico		
1.	Baca Location No. 1	168,761
2.	Gila Hot Springs	3,202
3.	Kilbourne Hole	25,134
4.	Lightning Dock	23,552
5.	Lower Frisco Hot Springs	5,760
6.	San Ysidro	1,915
7.	Socorro Peak	89,716
8.	Radium Springs	9,813
		327,853

GRAND TOTAL.....3,380,356

NUMBER OF KGRA'S..... 108

AREA GEOLOGISTS *

(Minus Oklahoma)

Mailing Address

1. Mr. Robert McMullin
Area Geologist, Alaska Area
U.S. Geological Survey
P.O. Box 259
Anchorage, Alaska 99510

FTS 8-399-0150
Commercial: 907-265-4376

2. Mr. Henry Cullins
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345 Middlefield Rd., MS 80
Menlo Park, California 94025

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3. Mr. Dan Jobin
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USGS, Conservation Division
Box 25046, MS 602
Denver Federal Center
Denver, Colorado 80225

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4. Mr. Elmer Schell
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5. Mr. Don Van Sickle
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P.O. Drawer 1857
Roswell, New Mexico 88201

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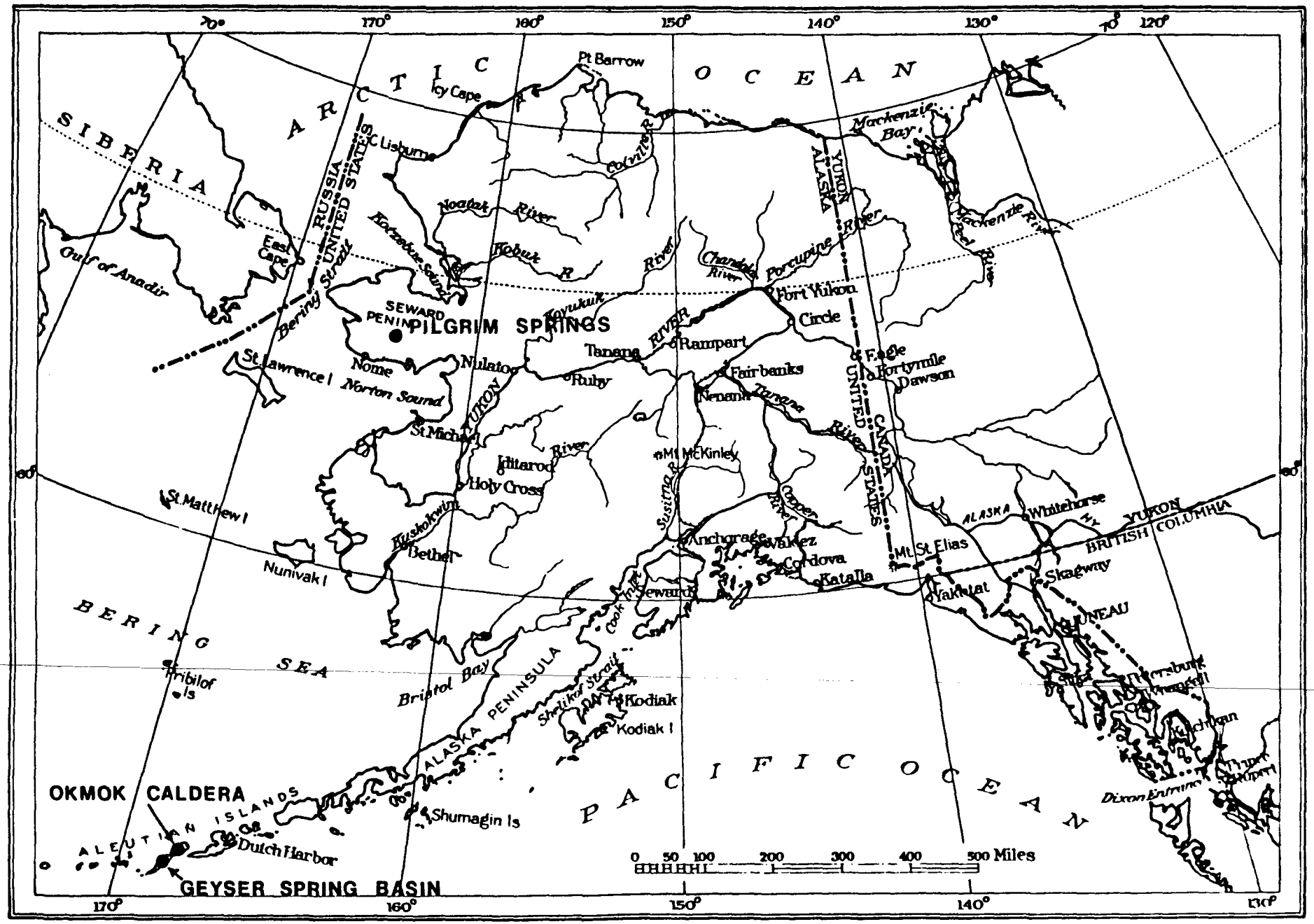
Commercial: 505-622-1322

6. Mr. John Lees
Area Geologist, Eastern Area
U.S. Geological Survey
1725 K Street, Rm. 213
Washington, D.C. 20244

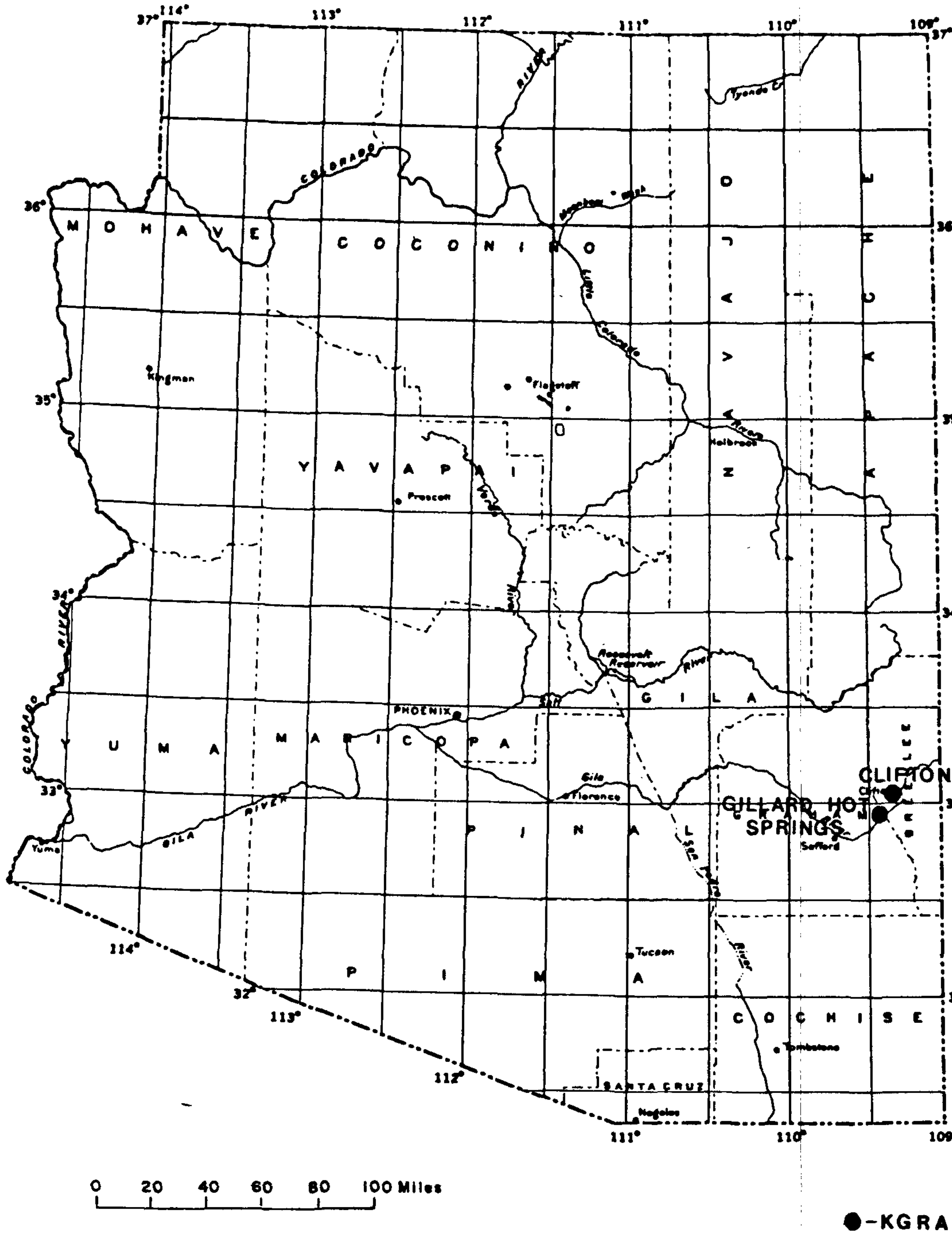
FTS 8-254-5526
Commercial: 202-254-5526

* Contact the appropriate Area Geologists Office to obtain copies of the Land Classification Minutes of each KGRA and to obtain state maps at a scale of 1:500,000 showing all KGRA's plus all lands classified valuable prospectively for geothermal resources in that state.

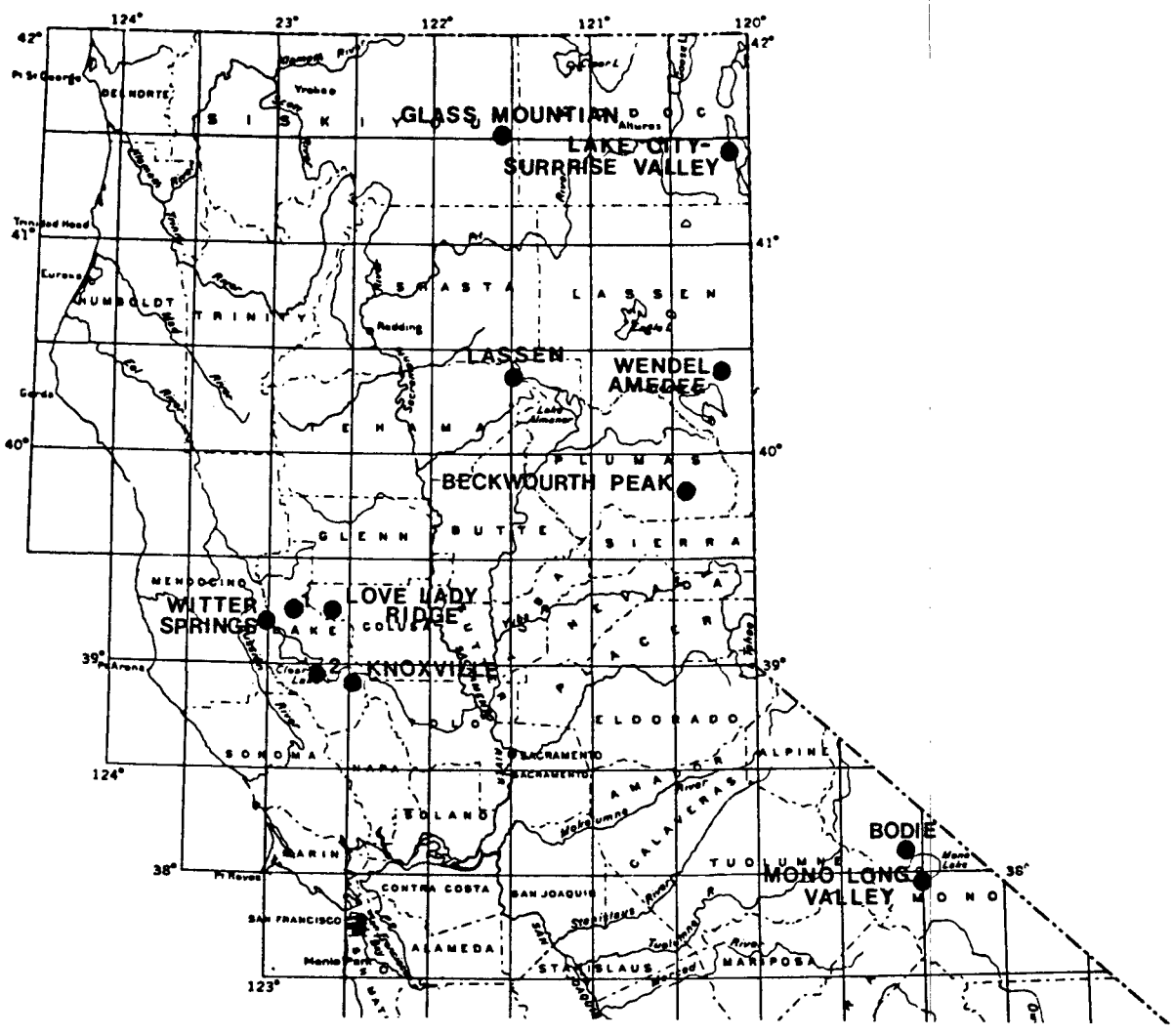


KNOWN GEOTHERMAL RESOURCE AREAS IN ALASKA

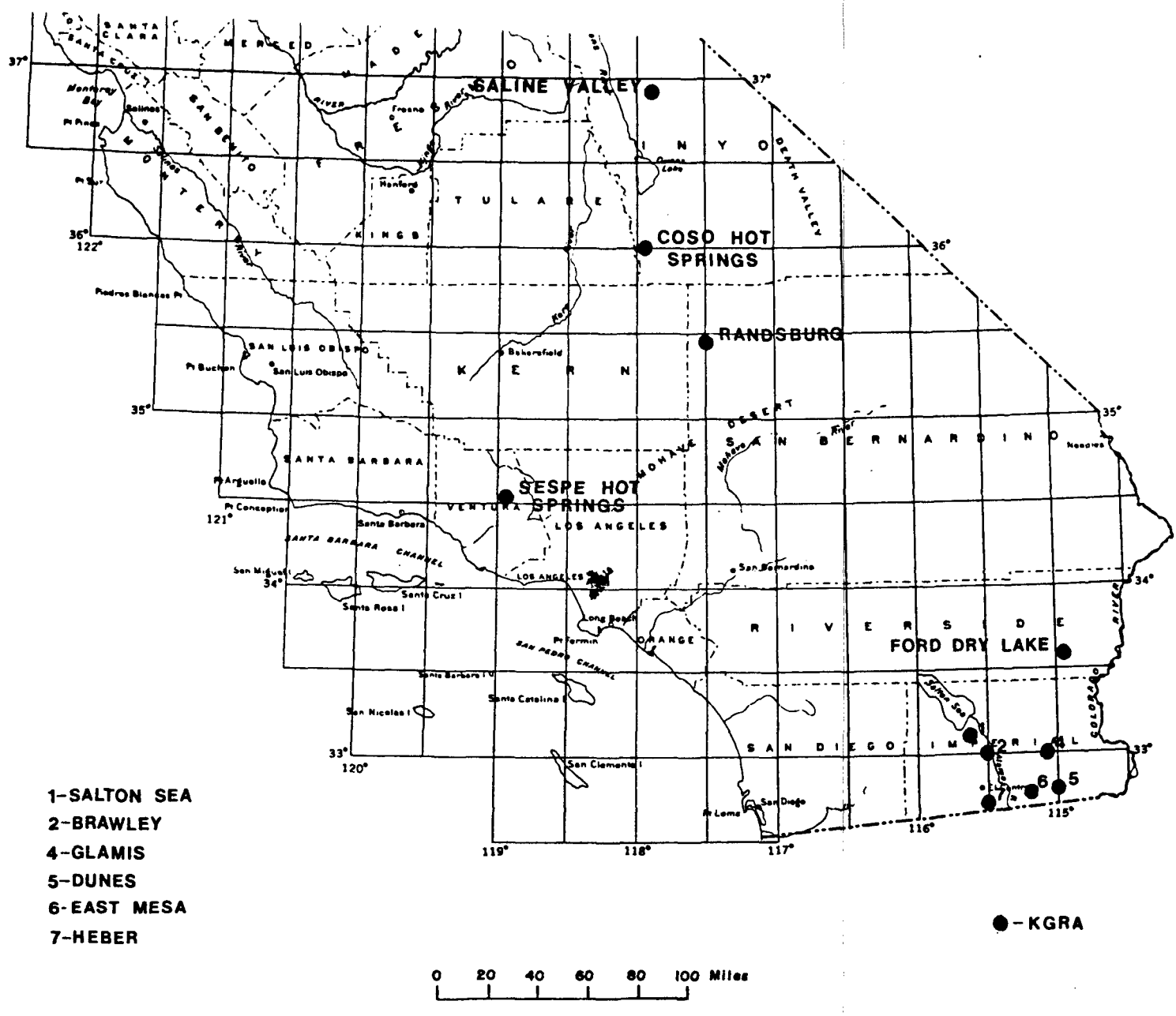
JULY 1977



KNOWN GEOTHERMAL RESOURCE AREAS IN ARIZONA



KNOWN GEOTHERMAL RESOURCE AREAS IN NORTHERN CALIFORNIA



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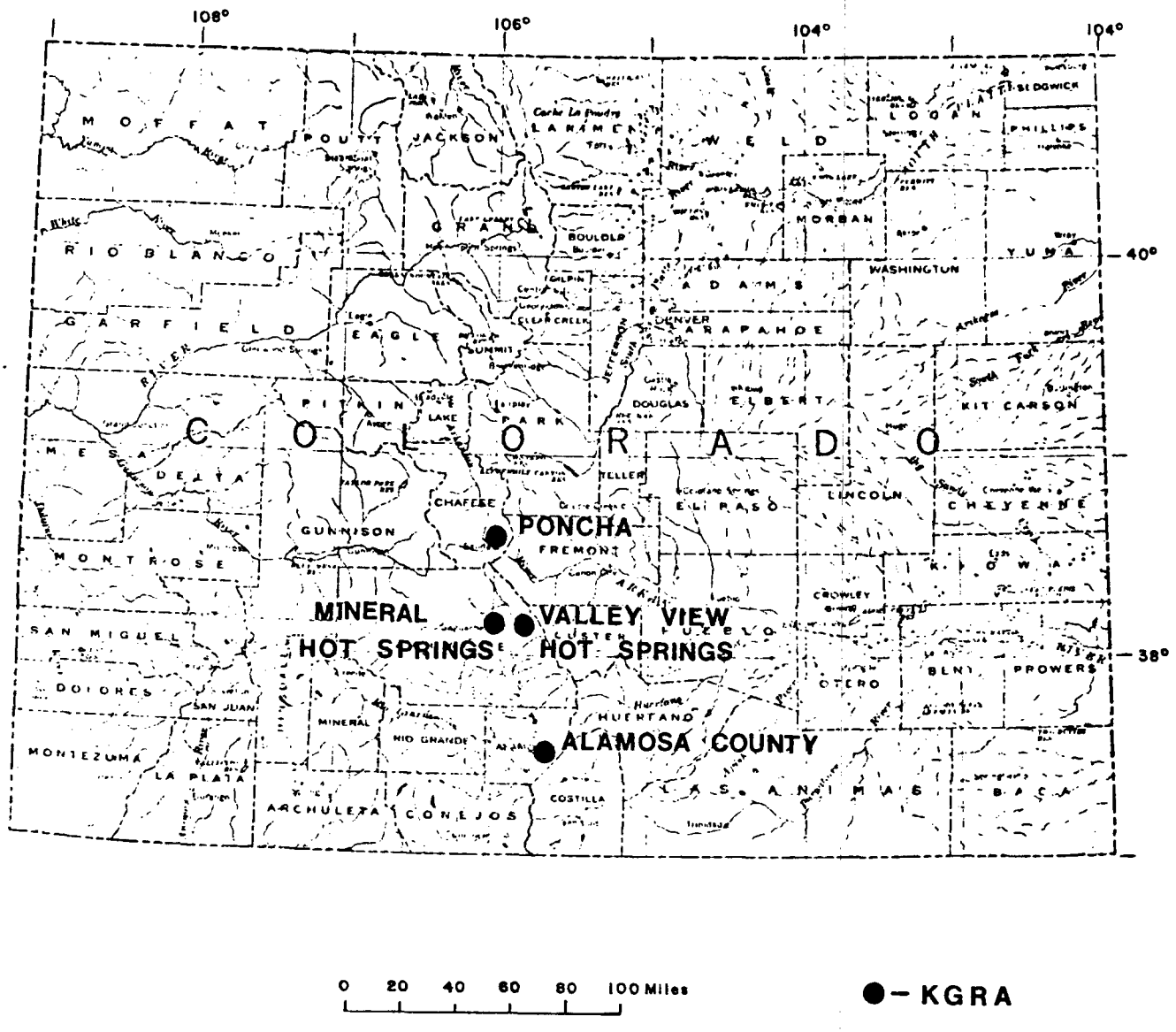
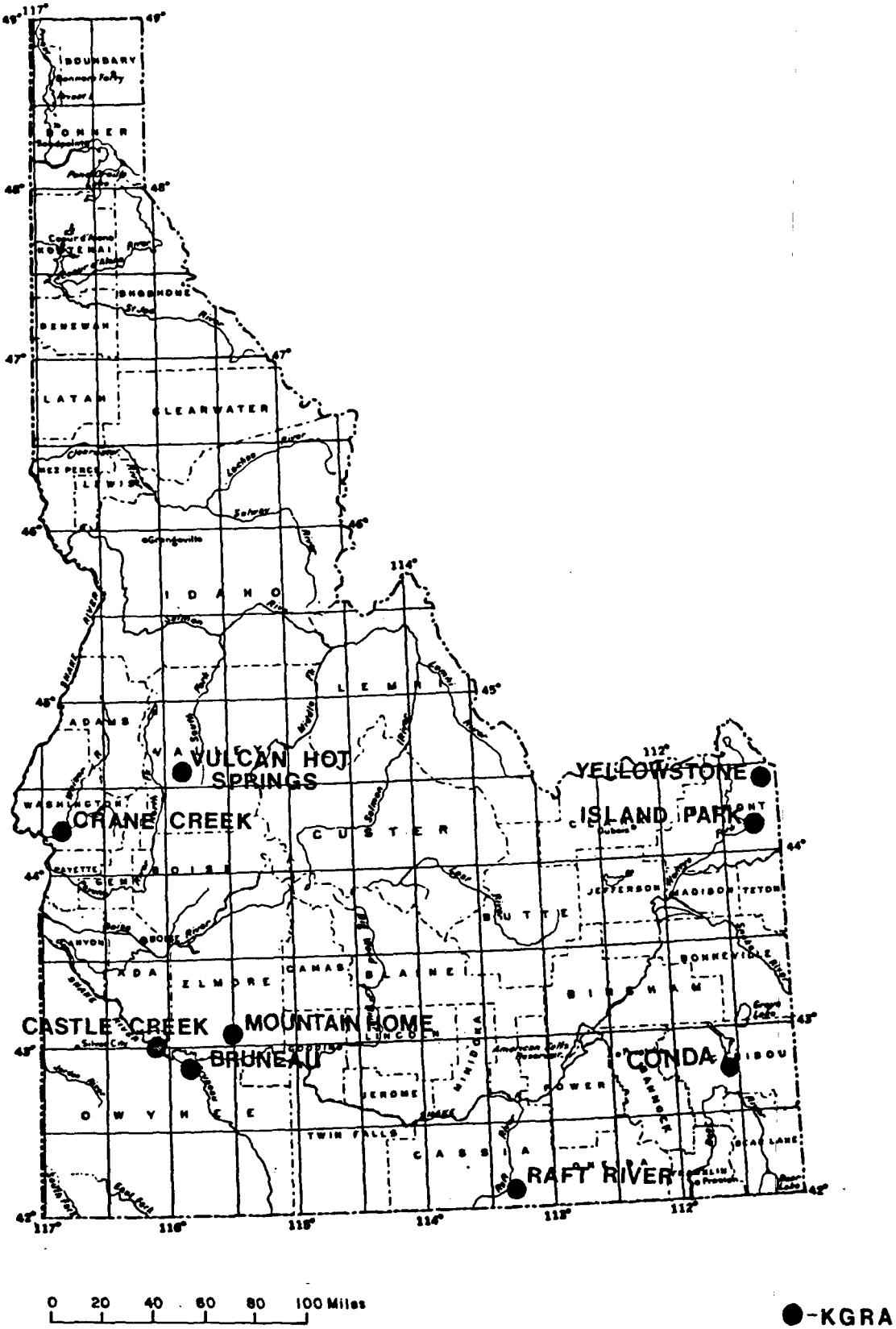
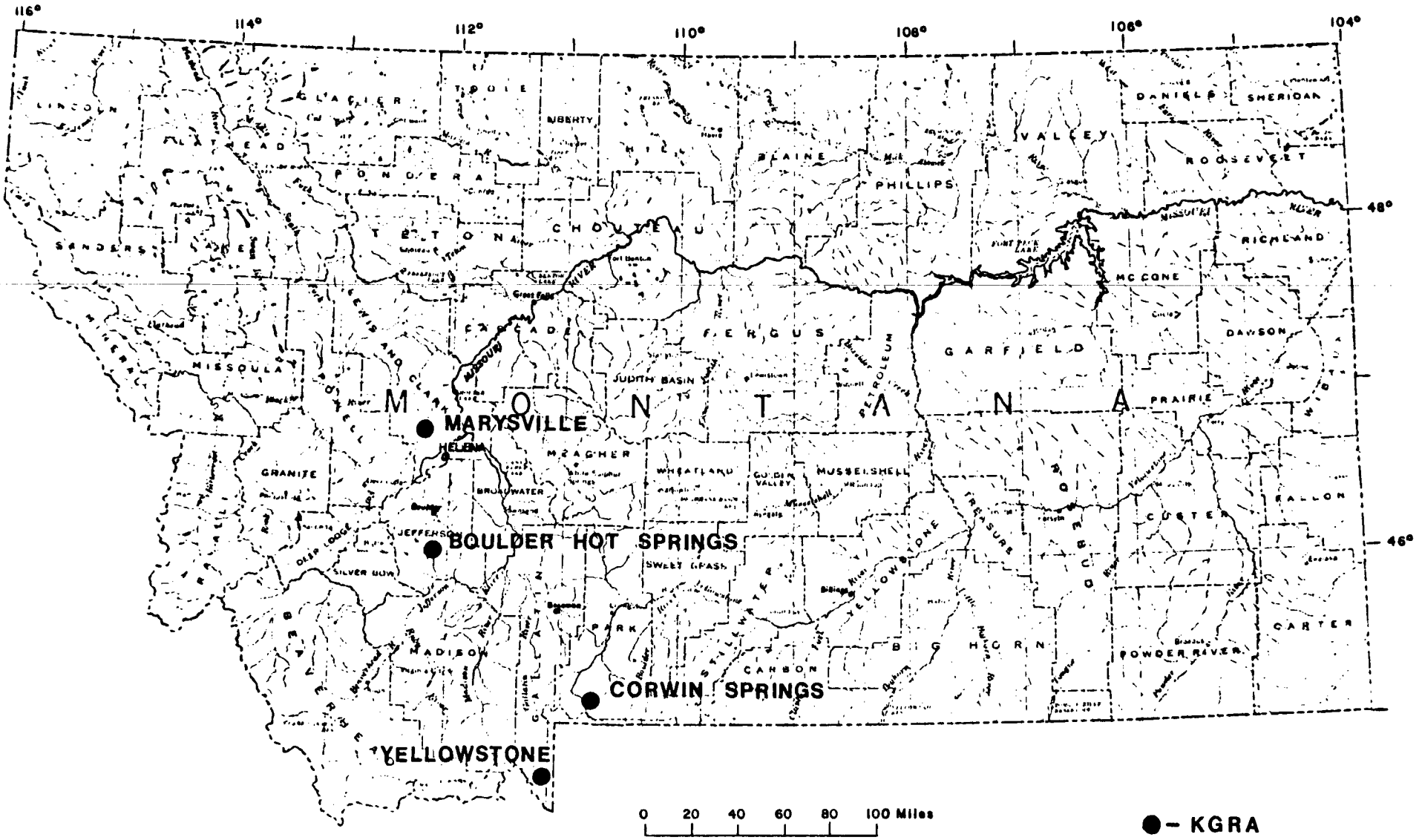


KNOWN GEOTHERMAL RESOURCE AREAS

IN COLORADO

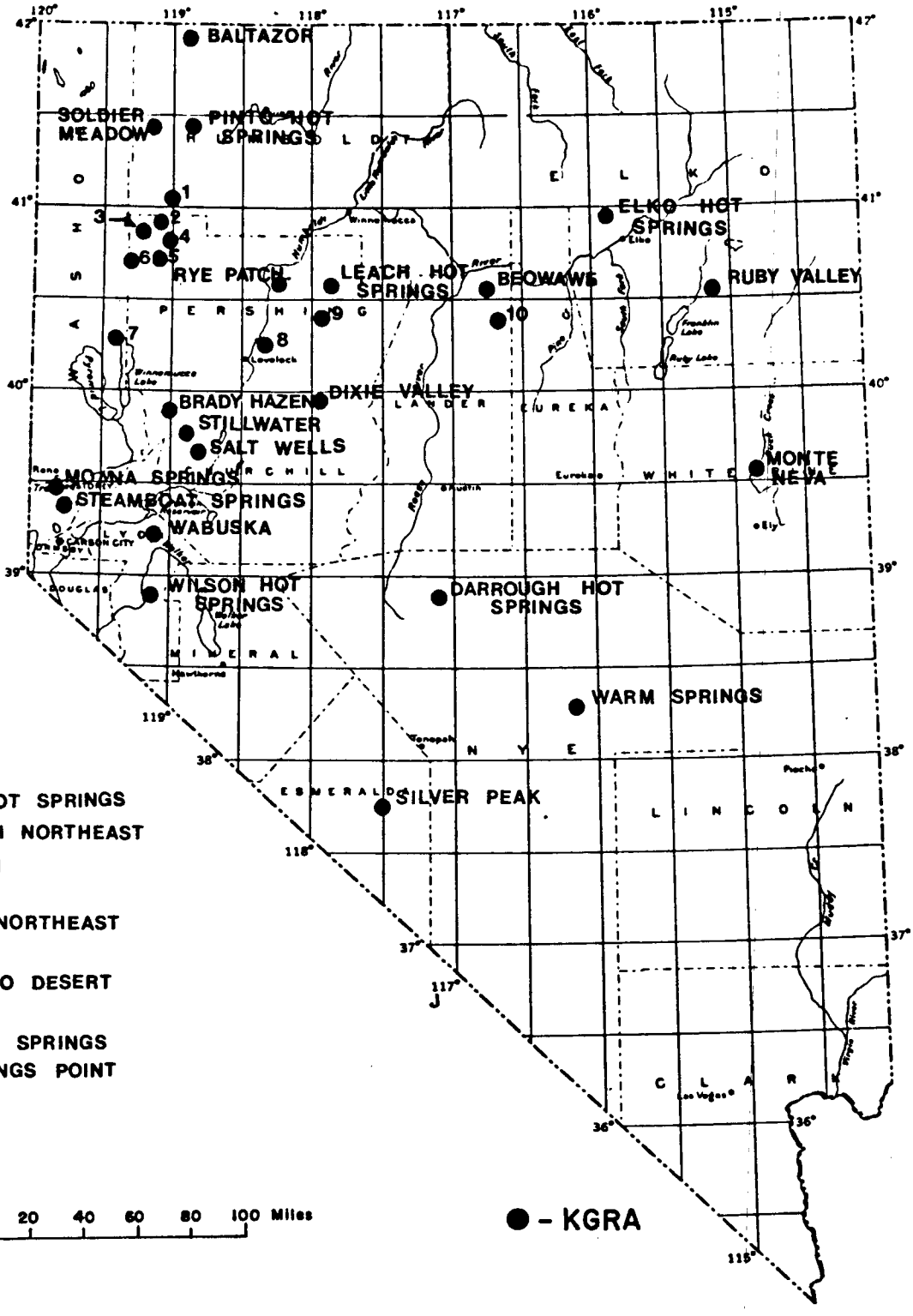


KNOWN GEOTHERMAL RESOURCE AREAS
IN IDAHO

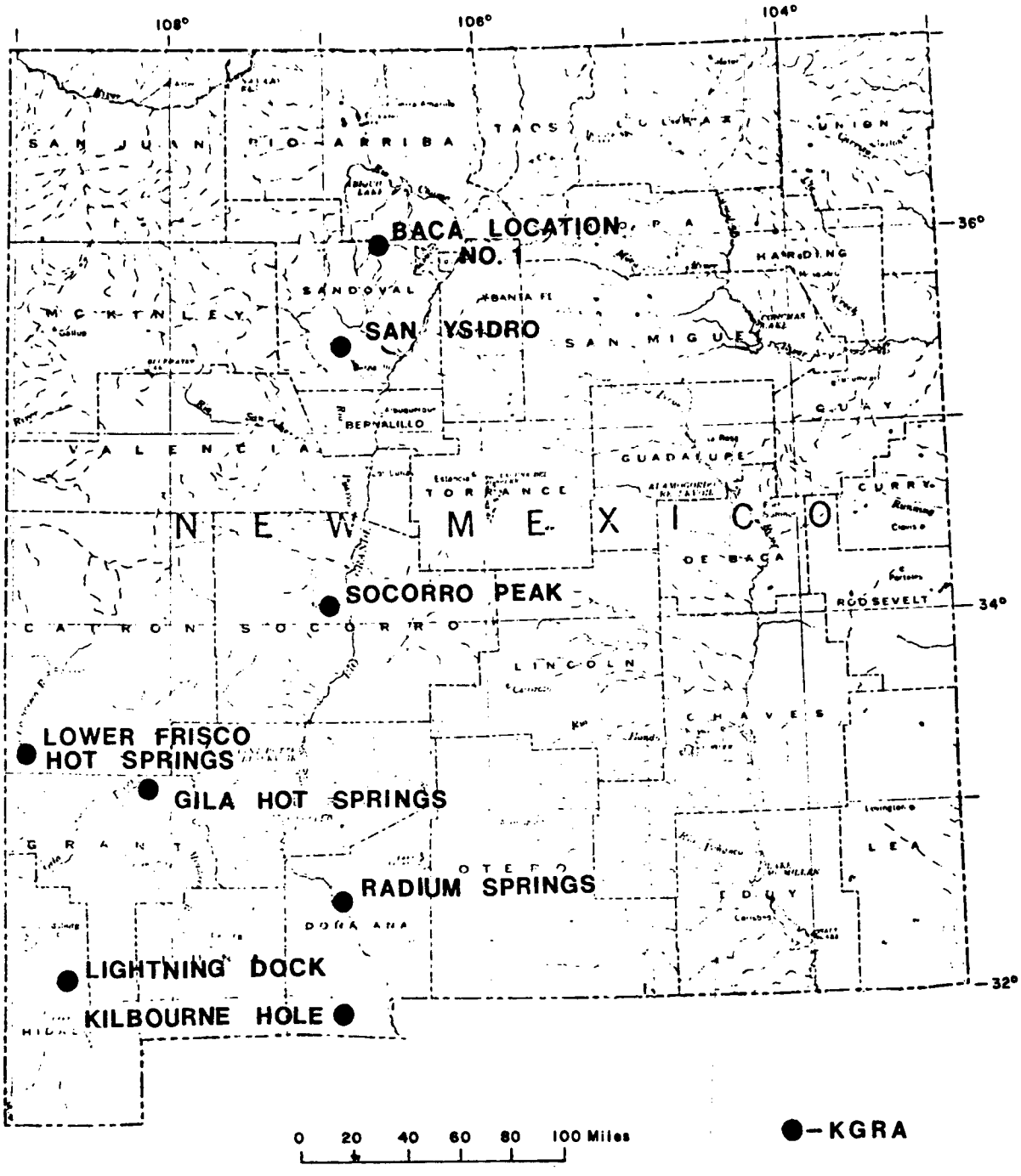


KNOWN GEOTHERMAL RESOURCE AREAS IN MONTANA

JUNE 1977

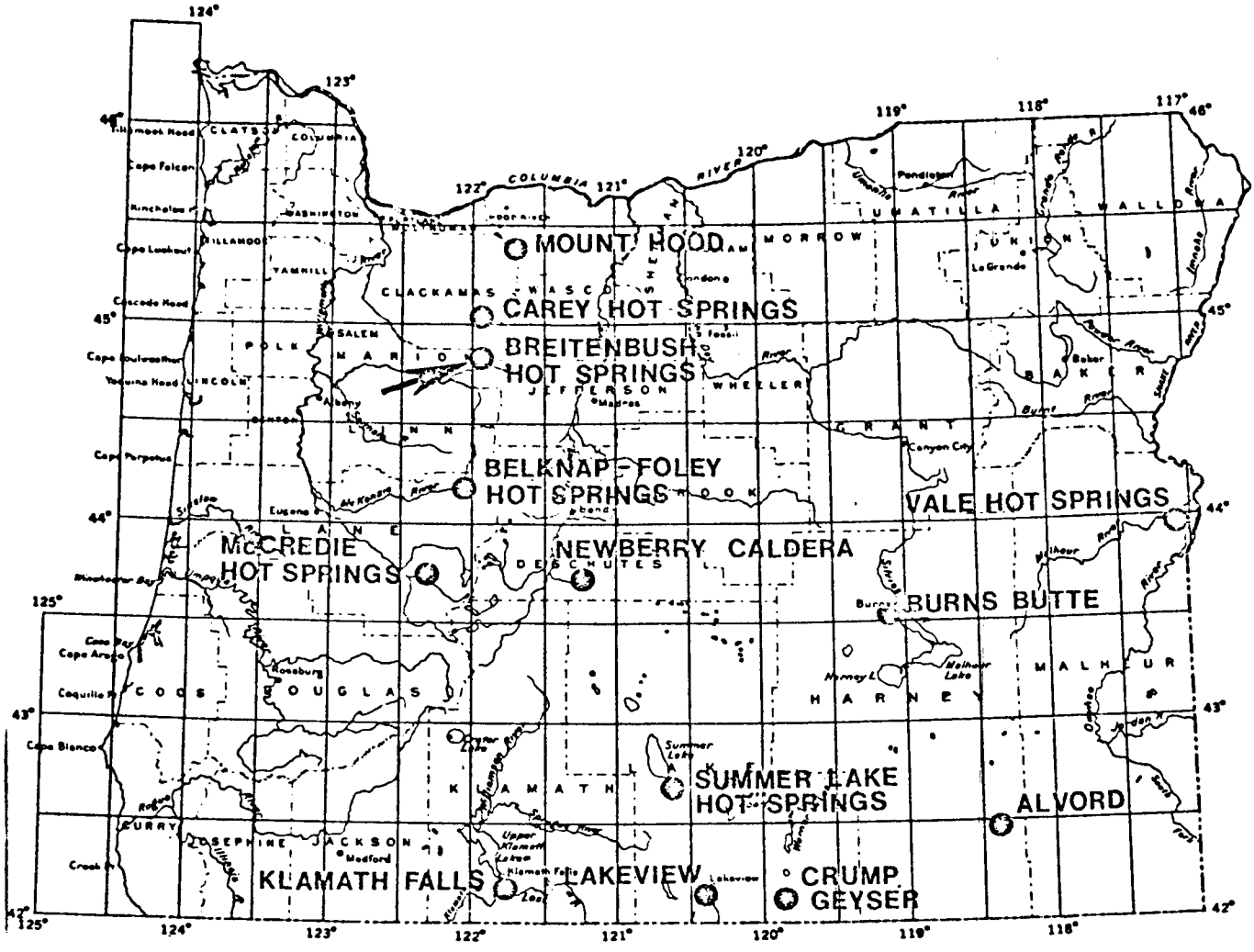


KNOWN GEOTHERMAL RESOURCE AREAS IN NEVADA

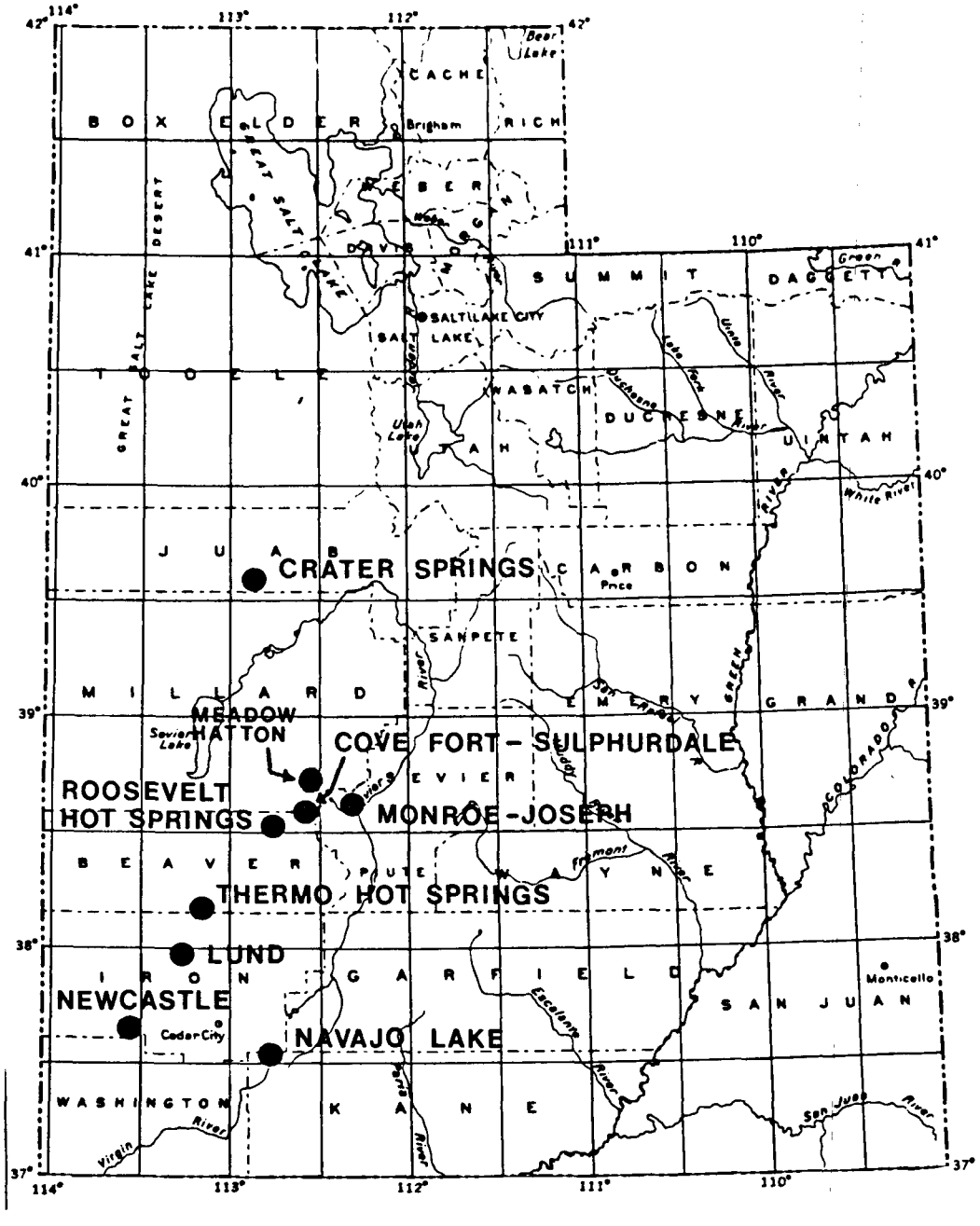


KNOWN GEOTHERMAL RESOURCE AREAS

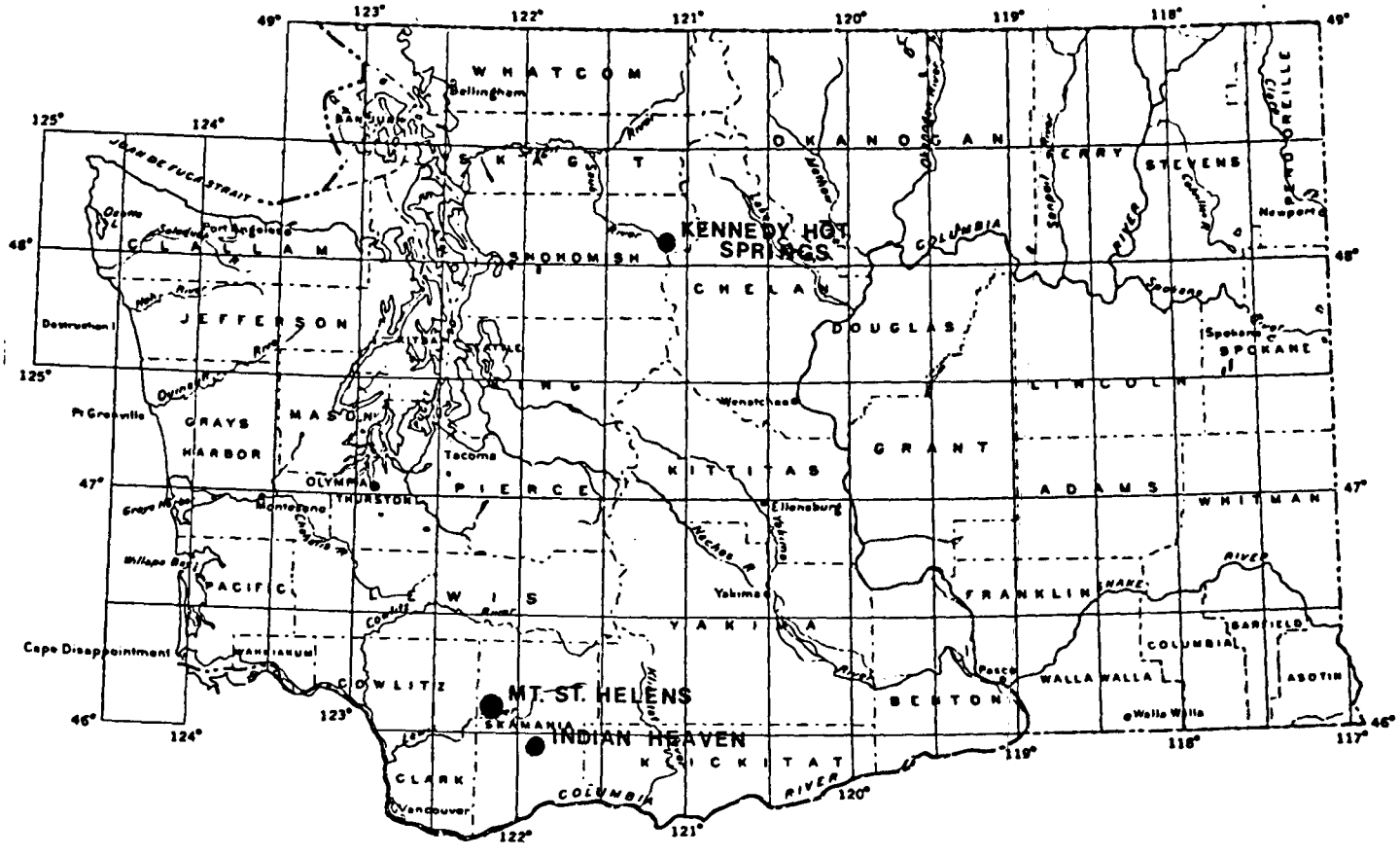
IN NEW MEXICO



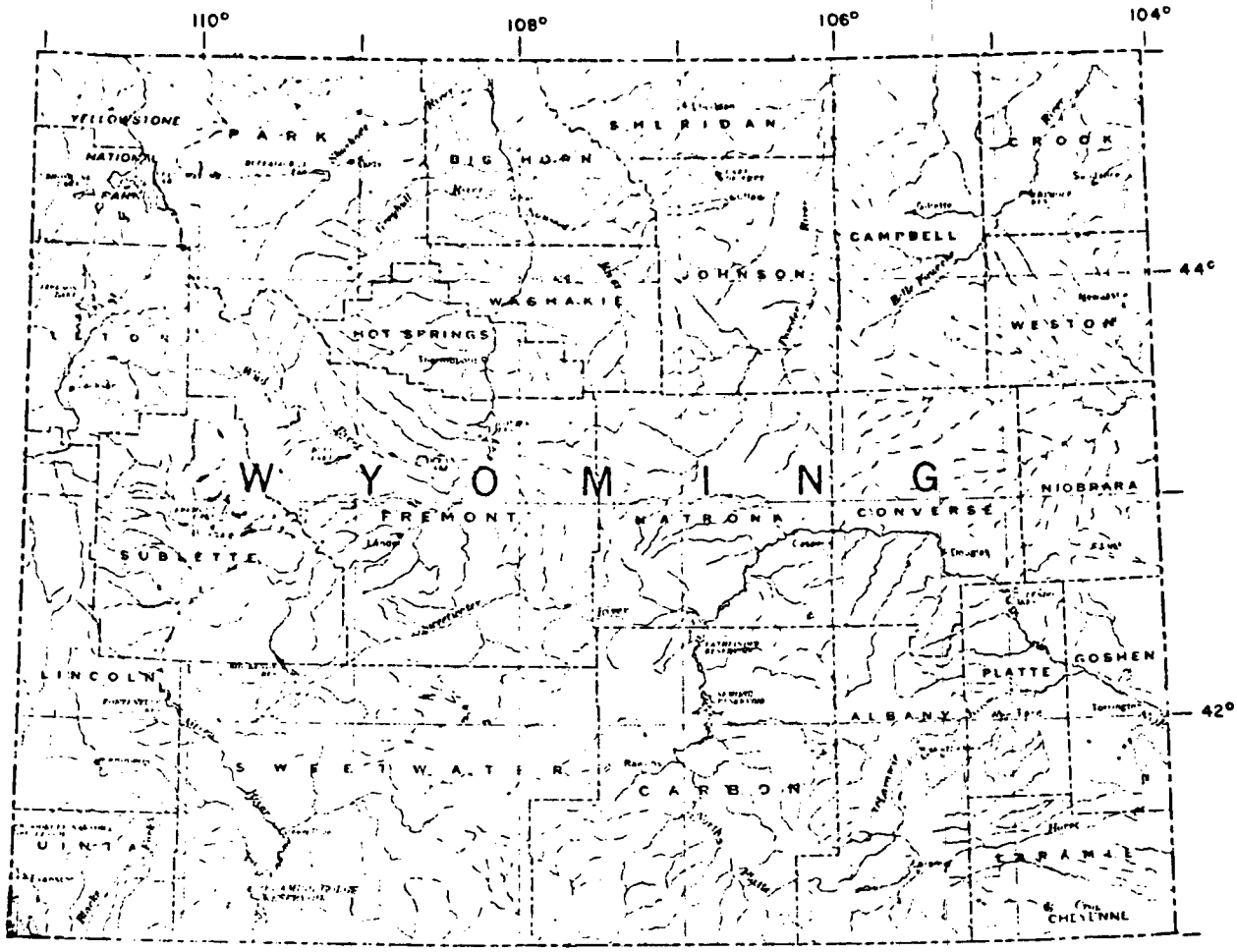
KNOWN GEOTHERMAL RESOURCE AREAS IN OREGON



KNOWN GEOTHERMAL RESOURCE AREAS IN UTAH



KNOWN GEOTHERMAL RESOURCE AREAS IN WASHINGTON



NO KNOWN GEOTHERMAL RESOURCE AREAS

IN WYOMING