

Wright
11 Sept 79

GLO2522

April 27, 1979

Nampa-Caldwell Area

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by J. Anderson

Abstract

to be prepared last by J. Mitchell

General Introduction
Purpose and Scope
Well and Spring Numbering System
Use of Metric Units

by J. Anderson

Specific Introduction
(Present and potential geothermal
use in the Nampa-Caldwell area)

J. Anderson to prepare near
end of study

Near Surface Geology and Groundwater
Hydrologic Analysis

by J. Anderson (bibliography list
to be provided)

Geochemistry of Warm Groundwater
(To include
isotope analysis critical path
items - writing must await the
results of the chemical analysis)

by J. Mitchell (sampling completed
by June 15; results returned by
August 1; chapter to be written by
September 1)

Gravity Magnetics Analysis

(gravity to be drafted by R. Olsen
by June 1, magnetics by J. Mitchell
after aeromagnetics data received
by August 1) combined analysis by
J. Mitchell

Temperature Gradients and Heat Flow
Analysis

by R. Smith by July 15 (search for
new temperature gradient holes by
J. Anderson and review and integrate
data into R. Smith analysis)

Reflective Seismic Analysis

Contract analysis and write-up

Integrated Analysis

by J. Mitchell

Recommendations

by J. Mitchell

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by J. Anderson

DRAFT CONTENTS OF GEOTHERMAL STUDIES

April 27, 1979

Tyhee Area

Acknowledgements

Preface

Table of Contents

List of Illustrations

List of Tables

by L. Johnson

Abstract

to be prepared last by L. Johnson

General Introduction

Purpose and Scope

Well and Spring Numbering System

Use of Metric Units

by L. Johnson

Specific Introduction

(Present and potential geothermal
use in the Pocatello area)

L. Johnson to prepare near end of
study

Near Surface Geology and Groundwater
Hydrologic Analysis

by J. Anderson together with Linda

Geochemistry of Warm Groundwater

(To include carbon dating and
isotope analysis critical path
items - writing must await the
results of the chemical analysis)

by J. Mitchell

Gravity Magnetics Analysis

Chapter report to be done by
Russ Corbett - by June 1, edited
by J. Mitchell

Temperature Gradient Map and Short
Write-Up

by L. Johnson

Refractive Seismic Analysis (optional)

by contract contracted (w/inter-
pretations contracted)

Pump Tests with Write-Up

by J. Anderson

Integrated Analysis

Recommendations

Bibliography

by J. Mitchell

by J. Mitchell

by L. Johnson



State of Idaho

DEPARTMENT OF WATER RESOURCES

STATE OFFICE, 373 W. Franklin Street, Boise, Idaho

Wright
11 Sept 79

JOHN V. EVANS
Governor

C. STEPHEN ALLRED
Director

Mailing address:
Statehouse
Boise, Idaho 83720
(208) 384-2215

September 7, 1979

Mr. Joseph O. Lee
Contracting Officer
U.S. Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, ID 83401

RE: Contract No. DE-AS07-77ET28407, Modification A002 and Modification A003

Dear Joe:

The time for the completion of the final report on the studies for the above modifications is September 30, 1979. It appears we will need an extension of time if we are to use the reflective seismic data as the strong tool we have believed it can be for the location of geothermal conduit faults.

In our January letter report, it was indicated we were planning on using reflective seismic data. In each of the next five months of reports from February through June it was indicated we were attempting to negotiate with Chevron to acquire a copy of their seismic data in select areas at about 10-15 percent of the cost to our alternative of running our own seismic lines. We have just recently acquired this approval from Chevron to buy their data. It was not until this approval was given that we could begin earnest negotiations with a consultant to help us reprocess the data tapes and interpret the results.

Largely because of the lengthy time taken to get the Chevron data and the time now needed to work with a consultant, it appears we need about seven additional months from September 30, 1979 to complete both the Tyhee and the Nampa-Caldwell studies to the level that gives a complete reviewed and typeset report. This time extension should cover both Modification A002 and A003.

It is expected we will need three additional months' salary at full-time and two months' half-time salaries to complete the reports. Preliminary estimates show a total of approximately \$40,986 may be sufficient. This would be anticipated to be funded from our proposal of new work to be submitted for FY '80 funding. The need for this additional money comes about because of the extra costs involved in getting reflective seismic coverage of the Nampa-Caldwell area with the accompanying cost of reprocessing the seismic tapes and some consulting assistance in interpretation of the data. In

Modification A002 there was about \$26,575 of salary money remaining. See accompanying Projected Expenses for Modifications A002 and A003.

Since we are an estimated \$72,713 short of funds for the project, we propose to cut back in the following areas:

ALTERNATIVE I

Reprint previous geothermal reports \$7,800 x 1.441 =	\$11,355
Print Phase I - Statewide report - Print only 319 copies with money available in Modification A001	<u>20,372</u>
SUBTOTAL	\$31,727
Additional salaries of \$40,986 to be allowed to be spent on this project, but funded under FY 1980 funding from the new proposal	<u>\$40,986</u>
TOTAL	\$72,713

If there is not an allowance of additional funds to finish the Nampa-Caldwell and the Tyhee area reports, one alternative is to provide DOE all the data, including all geophysical data anticipated to be purchased, consultant reports, and our available draft write-ups. Only minor additional time would be spent on the Nampa-Caldwell and Tyhee projects after September 30th.

The second alternative is to immediately cut back the scope of the geophysical data and related information that would be purchased. This would allow salary money to be available to be carried forward to the first part of the next federal fiscal year in order to complete the report. The project would be reduced as follows:

ALTERNATIVE II

Alternative I reduction in printing		\$31,727
Geophysical data cancelled:		
Magnetotelluric - Nampa	\$ 6,112	
Seismic - Chevron, Nampa	25,000	
Reprocessing Tape	4,874	
Consultant Assistance	<u>5,000</u>	
		<u>\$40,986</u>
TOTAL		\$72,713

A third and last alternative is to proceed as if we will be receiving approval on the new proposal to finish the Nampa-Caldwell and Tyhee studies. We would seek in a timely manner all approvals necessary to acquire seismic data and consulting assistance. The actual ordering of the last increment of services (\$41,000±) would be withheld until the new proposal work item of finishing the current reports was approved. This waiting on the approval of the new budget might delay the project approximately one month with the corresponding need to use some of the heat flow proposal salaries for this project. The shortage of funds will be made up as follows:

ALTERNATIVE IIIa

Same as Alternative I except salaries to be allowed to be spent on this project, but funded under the new proposal. Could be increased about \$10,800 or one month's salary.

If this work item of finishing the Nampa-Caldwell and Tyhee reports would not be approved for FY 1980 funding, then there would be a reduction in the amount of seismic and related geophysical information acquired. Again, this waiting on the approval of the new budget might delay the project approximately a month with corresponding need to use some additional geophysical data money for salaries. The shortage of funds will be made up approximately as follows:

ALTERNATIVE IIIb

Alternative I reduction in printing		\$31,727
Geophysical data cancelled		
Magnetotelluric - Nampa	\$ 6,112	
Seismic - Chevron, Nampa	35,000	
Reprocessing Tape (about)	5,674	
Consultant Assistant (about)	<u>5,000</u>	
		<u>\$51,786</u>
 TOTAL REDUCTION		 \$83,513
 This provides one additional month of salary		 <u>-10,800</u>
 PREVIOUS SHORTAGE		 \$72,713

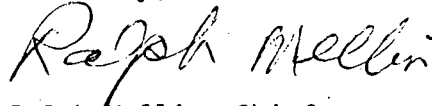
It is noted that our project leader and others involved in the project within our geothermal section definitely feel the acquisition of all proposed geophysical data is needed to produce a complete and acceptable final report for the Nampa-Caldwell area; yet, we will be guided by your group's opinion.

On a different matter, it should also be pointed out we had some additional time spent working on Modification A001 during the current fiscal year. Our quarterly December 31, 1978 progress report on Modification A001 dated January 19th indicated our report writing on this modification was still underway. After we received the review comments back from the draft reports sent out for review in March (yours by letter of March 19th), we took some staff time to integrate these comments into the final report and to correct errors we found in the computer prepared tables. The personnel involved have been two professionals and two technicians, plus a small amount of supervisor time for the time involved. It has been understood that this time was an acceptable use of our state-coupled geothermal funds allocated under Modification A002 and A003, yet no specific clarification has been written in regard to our Modification A002 or A003 contract. If this clarification is needed, it is requested that it be provided by letter.

Your review of this no-cost time extension request of Modifications A002 and A003, the question of the use of our DOE supported A002 and A003 staff time spent on Modification A001, and the proper alternative to select in the purchase of geophysical data will be appreciated.

Thank you for your assistance.

Sincerely,

A handwritten signature in cursive script that reads "Ralph Mellin".

Ralph Mellin, Chief
Geothermal & Land Resources Section

RM:mb

Enclosures

cc: Leland L. Mink

PROJECTED EXPENSES, MODIFICATION A002

	<u>Budgeted</u>	<u>Estimated Expense</u>	<u>Remainder</u>
Personnel Costs*	\$ 44,284	\$ 39,709	\$ 4,575
Travel	1,652	4,319	(2,667)
Vehicle Rental	9,275	4,087	5,188
Disposable Supplies for			
Sample Collection	1,000	150	850
Computer Time and Software	5,000	1,301	3,699
Miscellaneous Supplies	1,000	1,000	-0-
Miscellaneous Report			
Publication Costs	1,000	1,000	-0-
Vehicle Ownership Costs	1,250	-0-	1,250
Geologic Mapping	10,000	10,000	-0-
Gravity Survey Costs (done under			
salaries)	17,000	5,000	12,000
Graduate Student for Heat Flow			
(done under salaries - except			
for miscellaneous expenses)	10,000	1,000	9,000
Map Spring Deposits	15,000	12,000	3,000
Pump Tests	2,000	2,000	-0-
Water Quality Analysis	<u>11,528</u>	<u>7,964</u>	<u>3,564</u>
SUBTOTAL	\$129,989	\$89,530	\$40,459
Indirect Costs (29.5%)	38,347	26,412	11,935
Water Quality Equipment	12,000	-0-	12,000
Well Transducer	8,000	7,000	1,000
Conductivity Meter	1,000	-0-	1,000
Calculator	700	585	105
Isotope Tests	4,924	-0-	4,924
Neutron Activation	<u>11,040</u>	<u>-0-</u>	<u>11,040</u>
TOTAL	\$206,000	\$123,527	\$82,473
TRANSFER TO MODIFICATION A003			<u>(23,040)</u>
REMAINING FUNDS			<u>\$59,433</u>

* Note: The above gravity survey, \$12,000 and graduate student for heat flow, \$10,000 generally should be shifted to salaries. This would give an additional \$22,000 plus \$4,579 for \$26,575 remaining in salaries.

PROJECTED EXPENSES, MODIFICATION A003

	<u>Budgeted</u>	<u>Estimated Expense</u>	<u>Remainder</u>
Personnel Costs	\$103.926	\$103.006	\$ -0-
Travel	3,940	3,800	140
Computer Time & Software	2,800	1,530	1,270
Report Publications			
Reprint Previous Geothermal Reports	3,000	7,880	(4,880)
Prepare Modification 3 Report	<u>1,500</u>	<u>1,500</u>	<u>-0-</u>
SUBTOTAL	\$114,266	\$117,739	\$ (3,470)
Indirect Costs (44.1%)	50,391	51,922	(1,531)
Water Quality Analysis	5,000	-0-	5,000
Isotope Analysis (40 @ \$70 total)	4,924	2,800	2,124
Oil Field Catalog	1,000	-0-	1,000
Geophysical Surveys	47,459	119,156	(71,696)
Aeromagnetics- Nampa			
Committed	\$ 7,280		
Magnetic Tyhee			
Committed	2,100		
Magnetotelluric - Nampa	6,112		
Seismic - Anschutz			
Nampa	7,664		
Seismic - Chevron			
Nampa	61,000		
Reprocessing of Seismic Tapes	15,000		
Consultant Assistance in interpretation of seismic work	20,000		
	<u>\$119,156</u>		
Additional salary needs for 3 mos. total staff and 2 mos. at one-half staff at \$10,800 per mo. including indirect costs, i.e. Oct. 1979 to Feb. 1980	-0-	43,200	(43,200)
Additional costs to print Phase I (Modification A001) report @ \$15.00 per copy including indirect cost at a 15% rate.*	<u>-0-</u>	<u>20,372</u>	<u>(20,272)</u>
TOTAL MODIFICATION A003	\$223,040	\$355.085	(\$132,146)
TOTAL NEEDED FROM 1980 BUDGET		Modification A002	59,433
			<u>(\$ 72,713)</u>

* Total of 1,500 copies less 319 copies printed with modification A001 money \$15.00 x 1.15 x (1500-319).

August 31, 1979

Mr. Joseph O. Lee
Contracting Officer
U.S. Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, ID 83401

RE: Contract No. DE-AS07-77ET2807, Modification A001

Dear Joe:

The draft of this report was completed after the end of our contract period ended on September 30, 1979, and was sent out for your review by letter of March 19, 1979. The draft of the report was also sent for review to other agency personnel at this time.

The comments on these drafts have all been received back and have been integrated into a final draft. We have had trouble correcting what was thought to be minor errors in the report tables listed in our letter of March 19, 1979. Currently we are in the process of making the final past-up of these tables. The text of the report is currently being final typed and composed into a format for printing. Because of the size of the report, it is expected an additional three months is needed to final type and compose the report.

Upon completion of the above final typing and composing of the report, we will advertise for bids to print the report. It is expected this will take four weeks. Then the actual printing of the report may take up to eight weeks. The total remaining time needed to deliver this document is estimated to be five months from September 1, 1979. This would give a printed report by February 28, 1980. The printing bill will then be paid in March, 1980. Therefore, we request an extension of Modification A001 until March 31, 1980, from November 30, 1978, as covered in your letter of April 24, 1978.

Mr. Joseph O. Lee

2

August 31, 1979

We expect the report printing to cost approximately \$15.00 per copy. With our indirect cost rate of 15 percent in this modification, the total cost is \$17.25 per copy. A conservative number of reports that are needed is 1500. With the remaining funds in our contract of \$4793 plus the 15 percent indirect cost, we have \$5512 for printing. This gives enough money for about 319 copies. It appears the DOE printing office in Oak Ridge, Tennessee, can print the remaining reports. It is proposed that they print the remaining reports needed so additional funds will not have to be transferred from Modification A002.

Your answer to this request on a time extension and having DOE-Oak Ridge, or even NTIS, print report copies will be awaited before final action on our limited printing of this Modification A001 report is undertaken.

Sincerely yours,

RALPH MELLIN, Chief
Geothermal & Land Resources Section

RM: cjs

cc: Leland Mink

The Phase I data base is being expanded from the preliminary work for the Hawaii Geothermal Project. Besides general geologic data, including identification of rift zones, young volcanic areas, and calderas, some well temperature, chemistry, and productivity data have been compiled. Phase I assessment is complicated in Hawaii by locally high rainfall (to >400"/year) which can obscure geothermal waters. It is anticipated, therefore, that geothermal resources in Hawaii will generally be found below the depth of fresh water circulation. This washing effect depresses near-surface heat flow so normal gradient and heat flow studies may not indicate resource areas.

Initial Phase II assessment is being concentrated in the western part of Maui, an area with good resource potential and identified users.

ESL/UURI efforts in Hawaii have included assistance with proposal writing and coordination of tasks relating to Circular 790.

IDAHO

John C. Mitchell
Department of Water Resources
450 Washington Street
Boise, Idaho 83702

The data set from Idaho is, at this writing, the least complete set in USGS file GEOTHERM. Updating, with at least 300 new points, will begin soon. The ultimate reliability of these data will be excellent as the sites have been field checked and new chemical analyses have been made. Thirteen areas have been selected for depiction on the map that will accompany USGS Circular 790. One of these areas, the western Snake River Plain, has been divided into six sub-areas that are especially attractive for geothermal development.

The Phase I data base is nearly complete. A list of thermal wells and springs has been compiled, a map of spring deposits has been generated, lineament studies are in progress, and chemical analyses and data reduction are being finished. All of these data will be transmitted to NOAA. The Idaho resource maps will be the first non-preliminary maps published in the State Coupled Program. NOAA will have the updated USGS base map and selected geology prepared for display on the map.

Phase II studies continue in the Nampa-Caldwell and Bruneau-Grandview areas on the Snake River Plain, and in the Pocatello area at the margin of the Plain. Potential users have been identified in each of these areas.

The Earth Science Laboratory has had several meetings with the Idaho assessment team concerning discussion of Circular 790, map publication, proposal writing, resource assessment technique selection, and other tasks.

MONTANA

John Sonderegger
Montana Bureau of Mines and Geology
Butte, Montana 59701

Sixty-eight records from thermal springs and wells have been submitted by the Montana Bureau of Mines and Geology to USGS file GEOTHERM. Fourteen areas of moderately restricted areal extent were selected for inclusion on the Circular 790 map.

The Phase I data base now contains a fairly complete listing of thermal

IDAHO

Introduction

Five physiographic provinces occur in Idaho: the Snake River Plain, Northern Rocky Mountains, the Basin and Range, the Middle Rocky Mountains, and the Columbia Plateau (see Figure 36). Idaho is blessed with an abundance of shallow moderate- and low-temperature resources which are associated with faulting along the margins of the Snake River Plain and the Idaho Batholith of the Northern Rocky Mountains. The deeper, relatively undrilled Snake River Plains downwarp may contain high-temperature hydrothermal resources which are effectively concealed from surface exploration by the Snake River Plains aquifer, a high-flow rate, cold-water aquifer. The inventory of known thermal springs and wells by the U.S. Geological Survey and the Idaho Department of Water Resources is relatively complete. Industry interest is now focusing on the potential for production of high-temperature fluids from the Snake River Plain and from

the portion of the Basin and Range in southeastern Idaho near the Utah and Wyoming borders.

High-Temperature Resources

Confirmed Reservoirs. None.

A

Prospects. ↑ The northeastern Snake River Plain is a good prospect area. The age of the silicic volcanic rocks generally decreases from the western Snake River Plain towards Yellowstone National Park to the northeast. Sites around young rhyolitic occurrences in the eastern Snake River Plain, such as those in the Island Park caldera, constitute an attractive exploration target.

The Blackfoot volcanic field may also contain a high-temperature reservoir. This area in Bingham County contains silicic volcanic rock dated at less than 100,000 years Before Present. Surface evidence of hydrothermal activity is present, but not extensive.

Insights: Petroleum exploration drilling in southeastern Idaho has revealed to have recently discovered temperatures between 130°C and 200°C in 3 wells over an area of at least 800 sq. mi. Little is presently known about the nature, extent or temperature of hydrothermal convection systems which occur in this area. U.S.G.S Circular 790 lists 4 prospects being identified hydrothermal convection systems. This information together with

that being generated by industry probably indicates that concealed energy is being in this part of Idaho.

Potential for discovery appears to be
Potential for Discovery. ~~Though a few other areas in the Snake River Plain, particularly in the east, may have high-temperature potential, most researchers expect the fluids to be cooler.~~

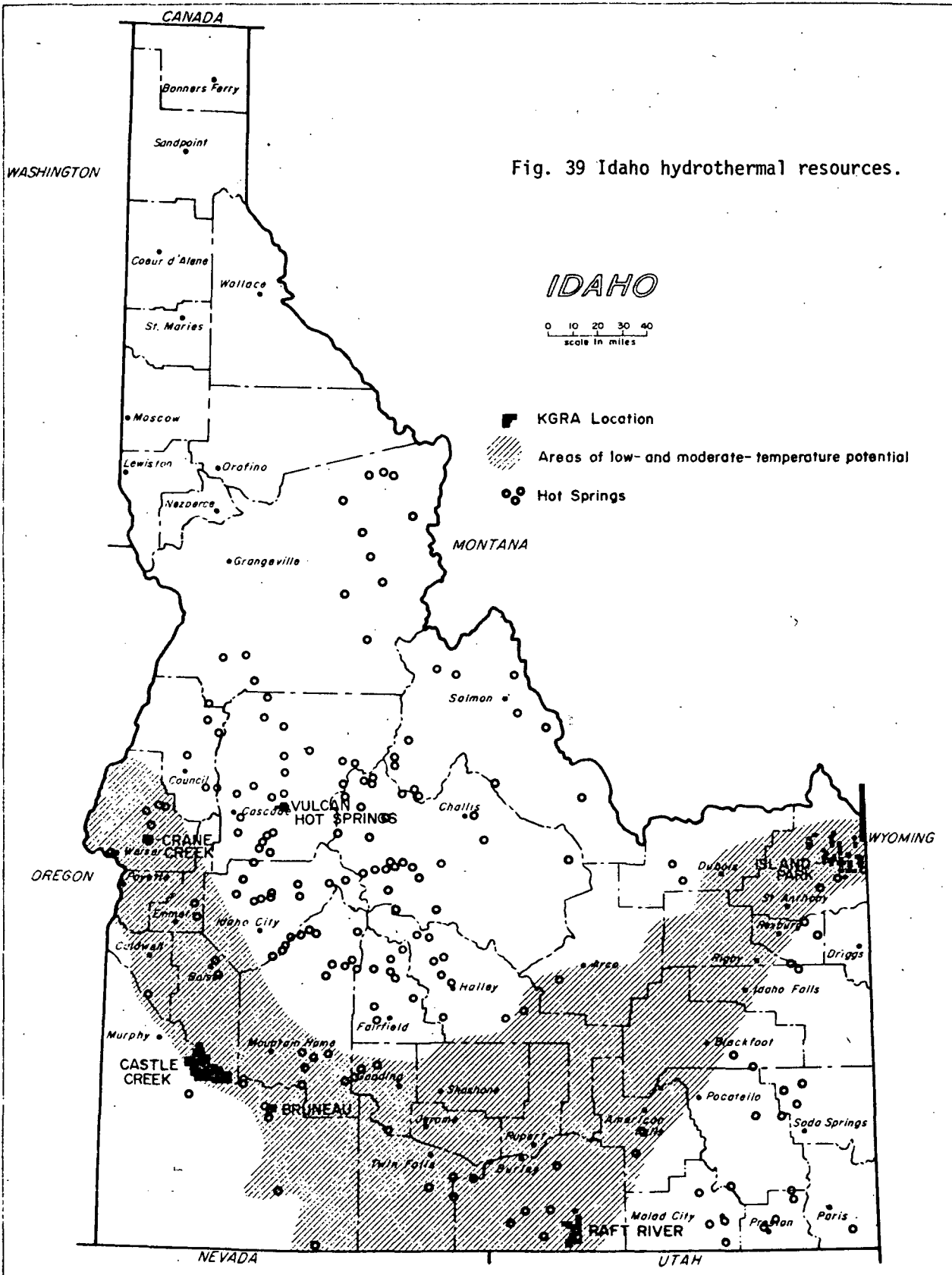
good in southwest Idaho along the margins and within the Snake River Plain.
Low- and Moderate-Temperature Resources (see Figure 39)

Confirmed Reservoirs. The northern margin of the western Snake River Plain contains widely distributed low- to moderate-temperature hydrothermal fluids. Some Boise homes have been heated with hydrothermal water since before the turn of the century. This resource is associated with the bounding normal faults and their intersection with generally north-trending lineaments that are well defined throughout the Idaho Batholith. In the Boise area, potable water in the 50 to 80°C range is produced from depths of 120 to 370 meters. The wells utilized by the District Heating System have been operated since 1890 without visible decline in productivity. Exploration and development are accelerating.

In the Bruneau-Grandview-Oreana area, at the southwestern margin of the Snake River Plain, lies a 20 x 100-kilometer region of low-temperature resources. The waters have been used extensively for agriculture, primarily for alfalfa irrigation.

Another confirmed resource is the site of the Department of Energy's Raft River Facility. Three production wells have confirmed the presence of a moderate-temperature reservoir near Malta, in Cassia County. Additional hot wells north and west of the federal project indicate a hot-water resource of considerable geographic extent.

The production of shallow hot water for space heating is rapidly escalating in the Buhl-Melon Valley of southern Idaho. No detailed resource assessment work has been accomplished, but the bounds of the known producing area are being expanded by step-out drilling.



Prospects. Water-well drilling near Pocatello, in Bannock County, has encountered 60°C water at 300 meters. ^{In addition, geothermal drilling already exists} The area is attractive due to the probable coincidence of rapid residential growth, existing energy-intensive industry (the phosphate industry) and low- to-moderate-temperature hydrothermal resources. Numerous warm springs occur in the mountainous areas of Idaho, but these areas are generally unpopulated. It has been reported that petroleum test wells in the overthrust belt of western Wyoming and extreme eastern Idaho have occasionally encountered anomalously warm water.

Potential for Discovery. Discovery potential is large for low- and moderate-temperature resources, especially in the southern portion of the state.

without paper has encountered hot fluids