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IDAHO GEOTHERMAL COMMERCIALIZATION PLANNING

SEMI-ANNUAL PROGRESS REPORT

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ABSTRACT

This report is a summary of the task accomplished during the first six months of the cooperative agreement between the U.S. Department of Energy and the Idaho Office of Energy. The report concentrates on geothermal resource data, regional and local development plans, energy and economic factors and institutional factors.

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1.0 Introduction

Idaho has a significant but largely undeveloped geothermal energy potential. Most of the known geothermal water is of relatively low temperature (below 150°C) and generation of electrical power from these sources is impractical at this time; however, the lower temperature hydrothermal resources can be developed for industrial process heat and spaceheating purposes. Heat loss through pipes and the high cost of piping limit the distances over which hydrothermal fluids can be transported. Thus location of geothermal resources in relation to current and projected energy demand is of great importance. Idaho is especially fortunate that its geothermal resources underlie its highest concentration of people, industry and commerce.

All of Idaho's petroleum products, natural gas and coal are imported from other states and nations. Hydroelectric power, solar energy, and geothermal heat are Idaho's major native energy resources. Much of the hydroelectric potential in Idaho has already been developed or is protected by wilderness classification. Geothermal energy is Idaho's major undeveloped energy resource. Approximately two-thirds of Idaho's population lives in areas with geothermal energy potential. Twenty-two of Idaho's thirty major industrial plants and food processing plants are located along the Snake River Plain in areas with geothermal resource potential.

The obstacles to geothermal development are 1) a lack of information regarding quantities and qualities of hydrothermal reservoirs, 2) institutional requirements and restrictions, 3) uncertainties regarding cost, and 4) limited amount of public and private funding. Certain assessments are needed to better understand and remove these roadblocks. The Idaho Operations Research Program seeks to assess these obstacles and begin to analyze and, where possible, encourage the development of geothermal resources. Partial findings and tentative answers found in the first half year of the program are summarized in this report. After six months of research, it is the initial conclusion of this program that there is significant opportunity and potential for geothermal resource development throughout the Snake River Plain Region while there is limited opportunity for development in the interior regions of the state. Further study, exploration, and experimentation will determine to what degree geothermal resources can or will be developed in Idaho. In some cases, development costs are acceptable and development plans are currently underway. As future energy cost and supply circumstances change there will most likely be more cases where geothermal development is the best future alternative. There are major institutional constraints which slow development in addition to cost problems.

Some of these have been analyzed and are discussed in this report. Others will require more extensive analysis.

1.1 Purpose of Project

The direct application of geothermal energy at various sites located within Idaho can be a significant factor in the effort to achieve energy independence for the United States. A state geothermal commercialization plan is important to both the U.S. Department of Energy and the Idaho Office of Energy for estimating the potential for geothermal energy utilization and, wherever possible, promoting and fostering its use in Idaho. It is the joint objective of the Department of Energy and the Idaho Office of Energy to establish a program in the Office of Energy which will assess and assist commercial geothermal resource development in Idaho.

1.2 Objectives

Area Development Plans:

During the first six months of the program the Office of Energy was to identify substate geographical areas which have potential for developing and utilizing geothermal resources between now and the year 2020. During the term of the program an area development plan will be compiled for each of the substate areas. The area development plans will identify the potential industrial, commercial and residential application of geothermal energy within the substate area. Geothermal prospects will be correlated with the identified market and the proposed application will be analyzed to determine the most practical and realistic development possible.

Site Specific Development Plans:

Site specific development plans are to be developed for sites within the substate regions with significant potential for future development of geothermal resources for proven applications. These plans are more detailed quantitative analyses of the technical, economic, environmental and institutional factors which influence the scale and timing of geothermal development and utilization.

Time Phase Development Plans:

The objective of this activity is to construct a real-time description of pending or current geothermal development projects and to identify actions and critical paths which are necessary for success of the project. It is a major goal of the program to complete two time phase development plans. The two sites are the cities of Boise and Rexburg.

Institutional Assessments:

The objective of this activity is to analyze local and state legislative and regulatory procedures and practices associated with geothermal leasing, exploration, field development, facility construction and utilization. Federal rules and regulations will also be considered. A major goal of this program element is to develop an information manual and procedure guide for geothermal resource development in Idaho.

Outreach Program:

It is a major program objective of the Office of Energy to organize and conduct a statewide geothermal outreach program. The outreach program is a form for interaction between the Office of Energy and geothermal development interests within Idaho and for coordination of regional commission activities.

1.3 Technical Approach and Team Members

Data and information on the following stages of geothermal development is being compiled from available sources: leasing, exploration surveys, drilling, field development, facility construction. The principal sources of this information are: Idaho Department of Water Resources, Idaho Department of Lands, Bureau of Land Management, U.S. Geological Survey, and the University of Utah Research Institute.

Data and information regarding potential markets for geothermal energy development is being compiled from historical and projected patterns of energy consumption in industry, agriculture, commerce, private residences and local units of government. The principal sources of this information are: Idaho Public Utilities Commission, U.S. Bureau of Census, Pacific Northwest Regional Commission and the Idaho Office of Energy documents and New Mexico Energy Institute.

The combination of the above sources will be used to identify and cross-match potential geothermal resources with potential applications. This type of correlation is the basis for the area development plans and the projections of geothermal energy on line between now and the year 2020.

Site specific and time phase plans are more detailed evaluations of technological, economic, environmental and institutional factors influencing geothermal development prospects at specific locations. Data and information on the following stages of geothermal development and utilization is being compiled: leasing action, accurate local drilling cost, current local residential, commercial and individual industrial energy demand, environmental conditions, institutional factors, and time requirements. In addition to the

aforementioned sources, principal private development interests, state and local officials and federal agencies are being consulted to ascertain the magnitude and timing of all projections.

Team Members, Idaho Office of Energy:

Wayne Hart, Director, Energy Resource Programs

Principal Investigators:

David McClain, Geothermal Program Coordinator

William Eastlake, Energy Economist

1.4 Benefits to Idaho and D.O.E.

The principal short-term benefit to the State of Idaho, under the DOE funded State Geothermal Planning Program, is the establishment of a planning and assistance program within the Idaho Office of Energy. This program currently provides information and advice to the Governor's Office, the State Legislature, other state agencies, local governments, industries, small businesses and individuals. This program has been instrumental in aiding the State Geothermal Task Force for geothermal retrofit of the Capital Mall and in coordinating the timing of this project with the Boise City Geothermal Project. Other contacts made by the Office of Energy with the Lava Hot Springs Foundation, College of Southern Idaho, and the Madison County Energy Commission have resulted in stimulation of geothermal development. The long term benefit to the state is the compilation of a data base which can be used for long range energy development planning.

The program also provides DOE with an accurate assessment of local environmental, institutional, economic and resource conditions which will affect the timing and scale of geothermal development in Idaho. A collaborative effort between the State and DOE has resulted and will continue to result in stimulated geothermal resource development and utilization of Federal geothermal research and development programs.

2.0 Summary of State Task and Work Accomplished

2.1 Area Development Plans

Five substate areas have been identified for area development analysis. These five geographic regions coincide with the boundaries of Idaho State planning regions and Bureau of Land Management Districts. The five substate regions are:

- 1) North Idaho, consisting of the ten northernmost counties,
- 2) Southwest Idaho, consisting of ten southwestern counties,
- 3) South Central Idaho, consisting of eight counties,

- 4) Southeastern Idaho, consisting of seven counties, and
- 5) Northeastern Idaho, consisting of nine counties. Research on the North Idaho Area Development Plan has been completed and a draft report is included in this report.

Research on potential for industrial geothermal energy utilization in the Southwestern region is 50 percent complete. The major industries in this region have been surveyed to determine actual energy consumption, types of energy presently consumed and process temperatures required. The communities in which these industries are located have also been assessed for district heating potential in terms of approximate energy consumption in the residential and commercial sectors, the number of business establishments and the number of housing units. The geothermal resources prospects have also been inventoried. Cross correlations between geothermal prospects and potential market areas have been initiated for communities with industrial sites only.

Industrial-community energy surveys are continuing for all other state planning regions. Area development plans for these regions will be compiled as data becomes available. Economic and institutional profiles have been compiled for all counties in the state. The institutional inventory includes all local and county planning controls.

2.2 Site Specific Development Plans

The Idaho Office of Energy with the cooperation of the Department of Water Resources has compiled a list of all major high temperature site specific geothermal prospects and potential geothermal industrial park sites in the state (see Table 3.1.1). All of these sites are candidates for site specific development plans. Those sites selected for analysis under this contract are:

- 1) Weiser Hot Springs, Washington County
- 2) Crane Creek KGRA, Washington County
- 3) Big Creek Hot Springs, Lemhi County
- 4) Bruneau KGRA, Owyhee County
- 5) Hailey Hot Springs, Blaine County

Data is currently being compiled for each of these sites. The site specific development plans will define the potential amount of geothermal development that is reasonable at these sites between now and the year 2020. Site plans will concentrate on analyzing institutional, environmental, and economic factors which will affect the timing and types of development possible at each site.

The Weiser Hot Springs site specific plan will analyze the criteria for establishing a geothermal energy based industrial park. Resource, institutional and market factors will be included in the analysis to determine the type and size of industry which could locate at the park site. The Crane Creek KGRA and Bruneau KGRA will also be examined for industrial park potential. Big Creek Hot Springs will be analyzed as a potential electrical generation site.

2.3 Time Phase Project Plans

A time phase project plan is a detailed time line scenario which outlines those critical tasks which must be completed to bring a geothermal development to successful completion. Time phase project plans are constructed for sites with specific development activities currently in progress or pending. Two time phase project plans will be developed in Idaho during this contract period. The two projects are: 1) Boise City Geothermal Project, and 2) Madison County Geothermal Project. Both developments are district space-heating projects for residential and commercial structures. The Madison County Project also involves a commercial food drying operation.

The Boise Time Phase Project Plan has been completed. This plan outlines the critical parallel tasks which are necessary for the coordinated and timely construction of the Boise City System, the rehabilitation and expansion of the Warm Springs Water District system and the retrofit of the State Capital Mall. The report also examines the economic feasibility of retrofitting and heating the seven state buildings in the Capital Mall. The Boise Time Phase Project Plan is discussed in detail in Section 3.0 of this report. The Madison County Project Plan is in the development stage. A completed plan is expected in August, 1979.

2.4 Application of Planning Report

Historically, local governments in Idaho have not followed any coherent policy in regard to industrial location and land use planning. Since the passage of the Land Use Planning Act of 1974, by the Idaho Legislature, local government has increased its involvement and responsibility for influencing growth in socially desirable directions. Local and state governments have a large stake in the results of locational development and a great power to influence development planning. Local city-county governments in Idaho, to a large degree, depend upon state government to show leadership in encouraging new growth and development. Also local governments in Idaho maintain a large degree of local control over growth.

The geothermal planning reports outlined in this report will provide an adequate data base and leadership for local government to encourage geothermal development through zoning and planning which take geothermal resource locations into consideration.

2.5 Institutional Assessment

Institutional assessment is an integral part of all the project plans previously described. A compilation of institutional factors is a major task of this project. The institutional assessment report will identify and analyze the local, state and federal legislative and regulatory procedures and practices relative to the development and commercialization of the geothermal energy. Institutional factors affect all phases of geothermal development from leasing to facility construction. The time requirements for each step in the institutional matrix are being documented for local, state and federal institutional requirements in the site specific and time phase plans. A summarized institutional report will detail the local state and federal institutional chains and identify the major areas of interface and constraint.

Institutional flowcharts for state and federal regulatory actions are currently being developed. The state institutional flowchart for development on state lands has been completed. The time factors involved are currently being studied. A legal overview of Idaho Code concerning geothermal resource development has been completed and is presented in Section 3.6.1 of this report. An inventory of local and county regulations has been completed and is listed in Section 3.2.2 of this report. An analysis of the state institutional flowchart is also presented in section 3.6.4 of this report.

2.6 Applicability of the Institutional Analysis

The development and analysis of detailed institutional chains helps to identify the major institutional constraints. Documentation of institutional steps and their associated time factors will provide a basis for all geothermal development planning in the state. The projection of future development activities will incorporate these institutional factors into site specific planning scenarios. Public and private developers must incorporate these time factors into their construction schedules.

2.7 Handbook

A major task of this project is to develop a handbook which identifies governmental regulations and procedures and the fundamental logistical factors involved in geothermal

development. The handbook will be an information manual and procedure guide for geothermal development interest typical of Idaho. The handbook will describe the agencies, regulatory factors that must be considered, and procedures for acquiring lease permits and selecting exploration and development contractors. The intent of the handbook is to describe the factors governing and influencing geothermal development in a clear easily readable form for the Idaho citizen.

A draft of the handbook has been completed and is currently being edited by the Idaho Office of Energy.

2.8 Outreach

The Outreach Program has three major functions: 1) interacting and assisting community, business, industrial and government interest in geothermal development; 2) disseminating information; and 3) coordinating regional programs with other Pacific Northwest states. The Outreach Program has directly assisted nineteen individuals, eleven small businesses and developers and twelve local government agencies. The program is disseminating information through the education and conservation programs of the Office of Energy and by responding to request. The Outreach Program has provided assistance, information and advice to the Idaho State Legislature, the Pacific Northwest Regional Commission, and the Western Governors Conference. A detailed explanation of the assistance and accomplishments of the outreach program is given in Section 3.7 of this report.

A major accomplishment of this program was the successful passage of legislation through the 1979 Legislature which allows cities to revenue bond geothermal district heating systems.

3.0 Specific Task Description and Products

3.1 Geothermal Prospect Identification

A. Electric Power Prospects:

The Idaho Department of Water Resources has recently completed an extensive water chemistry analysis of thermal springs and wells in Idaho. Those prospective sites with the highest geochemical temperatures with potential for electrical generation are listed in Table 3.11. The land ownership of these sites is listed in Table 3.12.

B. Industrial Prospects:

Table 3.13 lists the potential industrial park sites.

TABLE 3.11

High Temperature Geothermal Prospects

<u>Geothermal Site</u>	<u>County</u>	<u>Location</u>	<u>Land Ownership</u>	<u>Measured Temp* °C</u>	<u>Best Estimate* Subsurface °C</u>	<u>Types of Development Speculated and Notes</u>
Battle Creek H.S.	Franklin	T. 15 S., R. 39 E., Sec. 8	Private	84	250	Electrical Generation (Wet Steam), Industrial Food Processing, Gasahol.
Big Creek H.S.	Lemhi	T. 23 N., R. 19 E., Sec. 22	U.S.F.S.	91	175	Electrical Generation (Wet Steam), Institutional Restrictions.
Blackfoot Reservoir	Caribou	T. 6 S., R. 41 E., Sec. 19	Private, BLM, BIA	42	240	Electrical Generation (Possible), Based on dry oil exploration well.
Bonneville H.S.	Boise	T. 10 N., R. 10 E., Sec. 31	U.S.F.S.	85	142	Development not considered possible, Remote, Institutional Restrictions.
Crane Creek H.S.	Washington	T. 11 N., R. 3 W., Sec. 7	Private, BLM	92	176**	Electrical Generation (Wet Steam), Industrial Processing, Gasahol.
Cove Creek H.S.	Washington	T. 10 N., R. 3 W., Sec. 9	Private	74	172	Electrical Generation, Industrial, Agriculture (Livestock).
Indian Creek H.S.	Valley	T. 17 N., R. 11 E., Sec. 16	U.S.F.S.	88	142**	Wilderness Area.
Magic Reservoir	Blaine-Camas	T. 1 S., R. 17 E., Sec. 23	Private, BLM	72	174	Electrical Generation (Binary), Industrial Processing.
Raft River	Cassia	T. 15 S., R. 26 E., Sec. 23	BLM	147***	147	Electrical Binary Plant under construction, Gasahol.
Roystone H.S.	Gem	T. 7 N., R. 1 E., Sec. 8	Private	54	150	Electrical Generation (Binary), Industrial Processing.
Vulcan H.S.	Valley	T. 14 N., R. 6 E., Sec. 11	U.S.F.S.	84	147	Development not considered possible, Remote, Environment and Institutional Restrictions.
White Licks H.S.	Adams	T. 16 N., R. 23 E., Sec. 33	U.S.F.S., Private	65	145**	Electrical Generation (Binary), Space Heating, Industrial.
Weiser H.S.	Washington	T. 11 N., R. 6 W., Sec. 10	Private	78	156**	Electrical Generation (Binary), Industrial Processing, Food and Gasahol, Space Heating.

* Idaho Department of Water Resources, Bulletin 30, 1979.

** Quartz Temperatures.
All others are Na-K-Ca Temperatures.

*** Pump Test Temperatures at the Raft River Geothermal Test Site.

TABLE 3.12

OWNERSHIP OF GEOTHERMAL AREAS IN IDAHO MOST FAVORABLE FOR
HIGH TEMPERATURE RESOURCES:

Private Ownership:

<u>Site</u>	<u>County</u>
Battle Creek H.S.	Franklin
Cove Creek H.S.	Washington
Crane Creek H.S.*	Washington
Magic Reservoir*	Blaine-Camas
Roystone H.S.	Gem
Weiser H.S.	Washington
White Licks H.S.*	Washington

BLM Ownership:

Crane Creek KGRA*	Washington
Magic Reservoir*	Blaine-Camas
Raft River KGRA	Cassia

USFS Ownership:

Big Creek H.S.	Lemhi
Bonneville H.S.	Boise
Indian Creek H.S.	Valley
Vulcan KGRA	Valley
White Licks H.S.*	Adams

* Mixed Ownership

Crane Creek	Washington	Private and BLM
White Licks	Adams	Private and USFS
Magic Reservoir	Blaine	Private and BLM
Blackfoot Reservoir and Grays Lake	Caribou	Private, BIA, BLM

B. Industrial Park Prospects

Table 3.13 lists those prospective hydrothermal reservoir sites which have potential for developing geothermal industrial parks. The Weiser, Crane Creek, and Bruneau sites have been selected for site specific development plans during the contract period.

TABLE 3.13

POTENTIAL GEOTHERMAL INDUSTRIAL PARKS

Weiser Hot Springs:	Natural Gas, Railroad, Power, Private Land, Temp. 78-156°C*.
Battle Creek H.S. Preston, Idaho :	Natural Gas, Railroad, Power, Private Land, Temp. 84-250°C*.
Crane Creek H.S. :	Railroad, Private Land, Temp. 92-176°C*.
Cove Creek H.S. :	Private Land, Temp. 74-172°C*.
White Licks H.S. :	Private Land, Temp. 65-145°C*.
Roystone H.S. :	Private Land, Railroad, Power, Temp. 54-156°C*.
Magic Hot Springs :	Private Land, Near Railroad, Temp. 72-174°C*.
Bruneau KGRA :	Mix Ownership, Private-Federal, Natural Gas, Temp. 70°-140°C*.
Raft River KGRA :	Mix Ownership, Private-Federal, Temp. 147°C**.
Rexburg, Idaho :	Private Land, Railroad, Power, Natural Gas, Present Industrial, Resource undetermined.
Pocatello, Idaho :	Private Land, Railroad, Power, Natural Gas, Present Industrial, Resource undetermined.
Nampa, Idaho and Caldwell, Idaho :	Private Land, Railroad, Power, Natural Gas, Present Industrial, Resource undetermined.
Payette, Idaho :	Private Land, Railroad, Power, Natural Gas, Present Industrial, Resource undetermined.
Mountain Home KGRA:	Mix Ownership, Private-Federal, Power, Resource undetermined.

* Temperatures Range is shown as measured temperature and best estimate of subsurface temperature.

** Known temperature.

C. District Spaceheating Prospects

Table 3.14 lists all communities in Idaho within five kilometers of a 200C or higher thermal spring or well. All of these sites are considered potential space-heating locations. The total population of these sites is 272,736 people. This represents 33 percent of the state's total population and approximately 50 percent of the urban/community population. Two of these sites, Boise and Rexburg, have been selected for time phase project plans. Boise and Ketchum currently have operational geothermal heating systems.

D. Geothermal Leasing In Idaho

Approximately 689,000 acres of state and federal lands have been leased in Idaho for geothermal exploration. This is a substantial increase in leasing activity compared to the same period last year. Since October, 1978, federal competitive leases have shown no change in status. The number of noncompetitive acres leased has increased by 5 percent since October, 1978. The number of state acres leased has increased 600 percent during the same period of time. The substantial increase in state leasing is due to the rescinding of a moratorium of leasing state lands which had been in effect since 1975. Leasing activity is expected to slow after the initial application period. Tables 3.15 through 3.18 summarized the status of geothermal leasing in Idaho.

Although leasing activity and total acres leased in Idaho is increasing rapidly, the drilling activity has not kept pace. The major exploration activity in Idaho is currently for oil and gas in the Overthrust Belt in Southeast Idaho. Because this area is also geothermally active these exploration holes could prove a geothermal resource.

TABLE 3.14 *

Towns in North Idaho Within 5 km of a 20° C. or Higher Thermal Spring or Well

Town	Population	Known Surface T. °C.	Best Estimate Subsurface T. °C.	Present Use	Ownership	Location
Burke	30	27.6	?	Mine Waste	Private	T48N, R5E, Sec.10
Burgdorf	10	45	120	Pool	Private	T22N, R4E, Sec.1
Kellogg	3,811	32	?	Mine Waste	Private	T48N, R3E, Sec.6
Lewiston	31,554	20	?	Municipal Emergency Supply	City	T35N, R5W

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Towns in North East Idaho Within 5 km of a 20° C. or Higher Thermal Spring or Well

Ammon	3,360	20	?	Domestic	Private	T3N, R39E, Sec.30
Ashton	1,181	41	116	Unused	Private	T9S, R42E, Sec.23
Challis	850	40	69	Natatorium	Private	T14N, R19E, Sec.23
Clayton	41	41	99	Natatorium	Private	T11N, R17E, Sec.27
Ellis						
Newdale	285	32	93	Municipal	City	T7N, R41E, Sec.35
Rexburg	9,761	26	?	Irrigation	Private	T5N, R40E, Sec.36
Stanley	52	41	76	Unused	Private	T10N, R13E, Sec.3

*Idaho Department of Water Resources, Bull. 30, Part 9 (1979).

Towns in South Central Idaho Within 5 km of a 20° C or Higher Thermal Springs or Well

Town	Population	Known Surface T.°C.	Best Estimate Subsurface T.°C.	Present Use	Ownership	Location
Hailey	1,804	59	100	Space Heating	Private	T2N, R18E, Sec.18
Ketchum	1,780	71	101	Space Heating	Private	T4N, R17E, Sec.15
Twin Falls	23,616	29	66	City Pool	City	T10S, R17E, Sec.14
Oakley	698	47	90	Natatorium	Private	T14S, R22E, Sec.7
Albion	372	60	89	Irrigation	Private	T11S, R25E, Sec.11

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Towns in South East Idaho Within 5 km of a 20° C. or Higher Thermal Springs or Well

Chubbuck	4,095	40	185	Irrigation	Private	T6S, R34E
Lava Hot Springs	512	45	82	Space Heating Natatorium	Private State	T9S, R38E, Sec.21
Malad	1,848	25	61	Unused	Private	T14S, R36E, Sec.27
McCammon	619	20	?	Domestic	Private	T9S, R36E, Sec.3
Pocatello	42,565	41	62	Domestic	Private	T5S, R34E, Sec.26
Preston	3,284	84	150	Unused	Private	T15S, R39E, Sec.17
Soda Springs	3,487	28	54	Tourism Geyser	City	T9S, R41E, Sec.12
Weston	229	23	92	Irrigation	Private	T16S, R38E, Sec.24

Towns in Southwest Idaho Within 5 km of a 20°C. or Higher Thermal Spring or Well

	Town	Population	Known	Best Estimate	Present Use	Ownership	Location
			Surface T.°C.	Subsurface T.°C.			
	Cascade	916	43	66	Pool	City	T14N, R3E, Sec.36
	Council	850	22	?	Irrigation	Private	T16N, R1W, Sec.15
	Garden Valley (Crouch)	200	55	80	Pool, Space Heating & Greenhouse	Private	
	Idaho City	200	41		Natatorium	Private	T6N, R5E, Sec.1
	Meadows	650	43	96	Unused	City	T19N, R2E, Sec.22
17	Boise	92,901	71	96	Space Heating	City & Private	T3N, R2E, Sec.12
	Caldwell	15,643	28	70	Irrigation	City	T4N, R3W, Sec.28
	Cambridge	451	26	76	Unused	Private	T14N, R3W, Sec.19
	Emmett	3,943	20	?	Domestic	Private	T6N, R2W, Sec.14
	Glenns Ferry	1,387	38	68	Natatorium	Private	T5S, R10E, Sec.32
	Hollister	63	36	81	Irrigation	Private	T12S, R17E, Sec.31
	Midvale	447	23	68	Public Supply	City	T13S, R3W, Sec.8
	Mountain Home	6,755	23	?	Public Supply	City	T3S, R6E, Sec.26
	Mtn. Home AFB	6,000+	21	?	Irrigation	Private	T4S, R5E, Sec.26
	Parma	1,879	28	70	Public Supply	City	T4N, R3W, Sec.35
	Weiser	4,607	70	156	Natatorium	Private	T11N, R6W, Sec.10

TABLE 3.15

TOTAL ACREAGES OF GEOTHERMAL RESOURCE LEASES
IN THE STATE OF IDAHO

(May 1, 1979)

Federal Leases

Total Acreages of Competitive Leases in KGRAs:	41,887
All BLM	
Total Acreages of Noncompetitive Leases	293,945.15
BLM: 291,385.15	
Forest Service: 2,560	

State Leases:

Total Acreages of State Leases:	355,680
Total of All Acreages State and Federal Leased for Geothermal Resources:	691,512.15

STATE OF IDAHO
Geothermal Leases

	<u>Total Acres Leased</u>
Issued Prior to 1975 Moratorium	59,504 acres
Issued Since November, 1978, and as of April, 1979	320,098 acres
Subtotal	379,602 acres
Declined/Released by lessee as of May, 1979	23,922
Total Acres Under Geothermal Lease by State	355,680 acres

TABLE 3.16
 KNOWN IDAHO GEOTHERMAL RESOURCE AREAS
 ACREAGES, AND LESSEES
 (May 1, 1979)

<u>KGRA</u>	<u>ACREAGE</u>	<u>LESSEES</u>
Conda	2,566	None
Yellowstone	14,164	None
Vulcan	3,836	None
Island Park	28,539	None
Crane Creek	4,342	Supron Energy Corp (1,380)
Castle Creek	79,722	Dow Chemical Co., (2,080); Geothermal Resources International Inc., (2,353); Occidental Geothermal Inc. (16,412); Phillips Petroleum Co. (5,025); R. A. Pomeroy (2,492); L. J. Spangler (2,560). Total: 30,922
Bruneau	5,120	Occidental Geothermal Inc. (2,600)
Mountain Home	9,520	Union Oil of Calif. and Magma Energy Inc. (5,102)
Raft River	30,209	Raft River Rural Electrical Cooperative (1,883)
TOTAL KGRAs	175,452	Total Acres Leased (competitive leases): (41,877)

TABLE 3.17
NONCOMPETITIVE GEOTHERMAL LEASING
SUMMARY STATUS REPORT, IDAHO

April 30, 1979

APPLICATIONS

BLM	FS	SUBTOTAL	WITHDRAWN	REJECTED	AWAITING (1) ACTION		REFUSED
					BLM	FS	
649	309	958	270	175	164	160	30
BLM & FS		<u>23</u>			BLM & FS <u>16</u>		
		981				340	

LEASES

BLM	ISSUED		SUBTOTAL	BLM	ACRES		SUBTOTAL
	FS				FS		
165	1	166		291,385.15			
					2,560.00		
							293,945.15

(1) Applications awaiting action for the following reasons;

- 3 Awaiting KGRA report from USGS
- 100 Pending preparation of EAR (BLM only)
- 173 Awaiting comment of other agencies
- 0 Lease forwarded for signature
- 64 Processing (Adjudication) - BLM

(2) 14 Leases relinquished or terminated (21,207.95 Acres)

TABLE 3.18

STATE OF IDAHO GEOTHERMAL LEASES
Total Acreage Per County Leased
State School and Other State Lands
(Prior to 1975)*

Owyhee County	19,137 acres	Most of these leases are held by Occidental Geothermal, Inc.
Fremont County	12,794 acres	Leases held by Occidental Geothermal, Inc. and Warren D. Barrells.
Elmore County	8,640 acres	Leases held by Gulf Oil Corporation
Washington County	5,089 acres	Leases held by Phillips Petroleum Company
Cassia County	4,520 acres	Leases held by Raft River Rural Electrical Coop. and Sun Oil Corp.
Clark County	2,553 acres	Leases held by R.L. Bullock.
Bonneville County	2,489 acres	Leases held by Chevron U.S.A., Inc.
Camas County	1,578 acres	Leases held by R.L. Bullock.
Ada County	1,562 acres	Leases held by Joe Kanta.
Madison County	666 acres	Leases held by Chevron U.S.A., Inc.
Bannock County	240 acres	Leases held by Sun Oil Company.
Franklin County	200 acres	Leases held by Chevron U.S.A., Inc.
Total State Lands Leased:	59,504 acres	Drilling requests have been filed for 3,021 acres, all of which are in Fremont County.

* In 1975 the State Land Board declared a Moratorium on geothermal leasing. The Moratorium was lifted in November, 1978.

Table 3.13 (Cont'd.)
Leases Issued 1979

<u>Lessee</u>	<u>Acres</u>	<u>County</u>
Andarko Production Co.	6,223	Bingham
	6,389	Bonneville
TOTAL	12,612	
Amax Exploration Company	9,600	Owyhee
Kenneth Britt	1,280	Bannock
	360	Boise
	3,280	Camas
	6,600	Cassia
	831	Clark
	12,172	Elmore
	39,490	Fremont
	5,123	Madison
	12,560	Owyhee
	2,980	Washington
TOTAL	82,684	
Chevron Oil Company	2,521	Bingham
	240	Bonneville
	8,384	Caribou
TOTAL	11,145	
Phillips Petroleum Company	11,569	Bingham
	6,272	Bonneville
	15,467	Caribou
	4,442	Clark
	1,566	Franklin
	8,433	Madison
TOTAL	47,749	
Laura J. Spangler	530	Fremont
Simaski Production Company	5,040	Camas
	1,280	Elmore
	640	Owyhee
	640	Washington
TOTAL	7,600	
Southland Royalty Company	1,271	Elmore
	640	Owyhee
TOTAL	1,911	
Supron Energy Company	25,477	Caribou
	2,640	Franklin
	160	Fremont
TOTAL	28,277	
Union Oil Company	10,300	Bingham
	30,306	Bonneville
	1,709	Canyon
	8,011	Elmore
	965	Franklin
	1,880	Gooding
	2,766	Lincoln
	57,981	Madison
	2,140	Owyhee
TOTAL	115,968	

Table 3.18 (Cont'd.)

Leases Declined
(May 1979)

<u>Lessee</u>	<u>Acres</u>	<u>County</u>
Kenneth Britt*	3,323	Cassia
	1,920	Elmore
	1,440	Fremont
	3,323	Madison
	8,309	Owyhee
	<u>2,304</u>	Washington
	23,922	

Total Acres Held By Kenneth Britt:

Issued	82,684
Declined	<u>23,922</u>
Held	59,692

3.2 Area Development Plans

The compilation of all the available information on the factors which are expected to affect geothermal development in Idaho began in 1978. The Geo-Heat Utilization Center and this author conducted an extensive survey of the available information regarding geothermal development potential in Idaho. This data base will be published by the Geo-Heat Utilization Center in July or August of 1979. That report is the data base for the Idaho Area Development Plans.

This year's task is to refine and update that report. Area Development Plans will be written for five substate areas which coincide with the state economic development regions. Area Development Plans will be written for the

North Idaho, Southwest Idaho, South Central Idaho, Southeast Idaho and Northeast Idaho regions.

3.2.1 State Geothermal Planning Regions

North Idaho:

The North Idaho region encompasses all ten counties north of the southern boundary of Idaho County, Idaho. This region covers approximately one-fourth of the state's landmass. The boundaries of this region coincide with the boundaries of the Coeur d'Alene BLM District, and Idaho State Planning Regions I and II. The North Idaho region includes Benewah, Bonner, Boundary, Clearwater, Idaho, Kootenai, Latah, Lewis, Nez Perce, and Shoshone Counties.

Southwest Idaho:

The Southwest region encompasses a ten county area which covers approximately one-fourth of the state's landmass. The boundaries of this region coincide with the boundaries of the Boise BLM District and Idaho State Planning Region III. The Southwest Idaho Region includes Ada, Adams, Boise, Canyon, Elmore, Gem, Owyhee, Payette, Valley, and Washington Counties. Five KGRAs are located in the region: Bruneau, Castle Creek, Crane Creek, Mountain Home, and Vulcan.

South Central Idaho:

The Southcentral region encompasses an eight county area. The boundaries of this region coincide with the Burley BLM District and State Planning Region IV. The South Central Idaho Region includes Blaine, Camas, Cassia, Gooding, Jerome, Lincoln, Minidoka, and Twin Falls Counties. This region includes the Raft River KGRA.

Southeast Idaho Region:

The Southeast region encompasses a seven county area. The boundaries of this region coincide with the Idaho Falls and Burley BLM Districts and State Planning Region V. The Southeast region includes Bannock, Bear Lake, Bingham, Caribou, Franklin, Oneida and Power Counties. Power, Bannock and Oneida Counties are in the Burley BLM District and the other counties are in the Idaho Falls BLM District. The Conda KGRA is also located in this region.

Northeast Idaho Region:

The Northeastern region encompasses a nine county area. The boundaries of this region coincide with the Idaho Falls and Salmon BLM Districts and State Planning Region VI. The

Northeast region includes Bonneville, Butte, Clark, Custer, Fremont, Jefferson, Lemhi, Madison, and Teton Counties. The Yellowstone and Island Park KGRAs are located in this region.

3.2.2 North Idaho Area Development Plan

INTRODUCTION

The Northern Idaho region encompasses all ten counties north of the southern boundary of Idaho County, Idaho. This large region covers approximately one-fourth of the state's land mass. The boundaries of this region coincide with the boundaries of the Coeur d'Alene BLM District and Idaho State Planning Regions I and II.

There are only a limited number of areas in this region with both adequate geothermal resources and local economic demands which could be satisfied by developing the geothermal resource. Areas in close proximity to geothermal resources are generally small isolated lumber and mining centers which are located in the river valleys of this mountainous region.

Six thermal areas were examined in the Panhandle Region: the Coeur d'Alene Mining District, the Lochsa area, the Lewiston area, the Red River area, the Burgdorf area, and the Riggins area. Except for the Coeur d'Alene Mining District, the majority of the thermal springs and wells in this region are found in a two thousand square kilometer area between the Lochsa and Salmon Rivers in Idaho, Lewis and Nez Perce Counties. Three geothermal areas, Riggins Hot Springs, the City of Lewiston and the City of Kellogg have limited commercial potential for geothermal resources. The Riggins Hot Springs area is a moderate temperature resource area. The City of Kellogg in the Coeur d'Alene Mining District and the City of Lewiston are low temperature resources which would require heat pumps for economic utilization. The other geothermal areas of the region are isolated mountainous areas with low to moderate resource potential and little or no market potential.

DESCRIPTION OF THE REGION

The North Idaho Region is a 30,410 square kilometer area which includes the ten northernmost counties of the state: Benewah, Bonner, Boundary, Clearwater, Idaho, Kootenai, Latah, Lewis, Nez Perce and Shoshone. The region is a high elevation, mountainous area cut by numerous rivers which creates a characteristic rough topography. Because the occurrence of thermal fluids is largely confined in Nez Perce, Shoshone and Idaho Counties, detailed data will be confined to those counties only. Regional economics will only be considered as a force affecting specific sites and will not be covered in detail.

Economic Districts

The North Idaho Region consists of two economic planning regions, the Panhandle Economic Development District and the Clearwater Economic Development District.

A summary description of these economic districts, their problems and goals, is presented in the following subchapters.

Panhandle Economic Planning Area - An Economic Profile

Includes: Benewah, Bonner, Boundary, Kootenai, and Shoshone Counties, also, the Kootenai and Coeur d'Alene Indian Reservations

Summary:

Population (1976): 99,200 or 11.9% of state

Population Distribution (1970): 8% farm, 58% rural non-farm,
34% urban

Population Growth Rate (1970-1976): 3.1% average annual rate

Net Migration (1970-1976): 2.4% average annual rate

Land Acres: 4,898,944 or 9.3% of state

Population Per Square Mile: 13

Land Ownership: 8.3% state and municipal, 39.3% private,
52.4% federal

Employment (1976): 36,713 or 9.5% of state

Employment Growth Rate: 3.56% average annual rate since 1970

Employment by Industry (1976): 25.8% mining/manufacturing,
5.8% agricultural, 68.5% resi-
dentiary

Per Capita Income (1975): \$4,622 or 88.8% of state

Unemployment Rate (1976): 7.2%

Employment Participation Ratio (1976): 37%

Characteristics:

The basic industries for this region are lumber and mining, agriculture and tourism. Of these industries, lumber and wood processing is the major industry. For example, in 1975 it produced 42.7% of the state's lumber production.

In mining, silver, lead, zinc, and cadmium are the major minerals mined in the region. The district produces more silver than the rest of the states combined, and almost 8% of the world's total. About 87% of Idaho's lead also comes from this region. Other by-products produced from mining in this region include copper, gold, antimony, and cobalt.

Employment in all of these industries is highly seasonal, peaking in the summer and reaching its low in the winter months. The retail and trade industries are also affected by the slowdown and winter conditions of this region. Advances of technology in agriculture, lumbering and mining industries, requiring less labor, have also contributed to the high unemployment rate.

The major transportation linkages are Interstate 90 which links the region to Missoula, Montana, 112 miles to the east, and to Spokane, Washington, 36 miles west of Coeur d'Alene; U.S. 95 links the region to Lewiston, 117 miles to the south. The rail facility for the region is the Burlington Northern route which passes through Spokane and Sandpoint, then goes north to Bonners Ferry and points east.

The major retail and trade center for this region is Spokane, Washington. Many people who live in the Panhandle also work in Spokane, thus using Idaho as bedroom communities while earning and spending in Washington.

Economic Potentials and Problems:

Besides an abundant supply of forests for lumber production and mines for continued output of minerals, this region has not fully developed its potentials in agriculture and tourism. For example, only about half of the 325,000 acres of cropland is being irrigated. With technical advances in sprinkler irrigation systems, most of the dry cropland has a potential of producing greater yields. This region also has the potential to develop its tourist trade with its lakes, rivers, streams, and vast scenic areas. Development of facilities for both summer and winter activities would enhance the tourist trade in the region.

There is a lack of an efficient transportation infrastructure in the region to facilitate effective trade and growth centers. For example, the lack of a major retail center in the region results in income being spent in Spokane, Washington. Another example is the timber taken from the southern part of Shoshone County must be taken into Montana for processing due to the lack of adequate roads into the Panhandle area. Tourist facilities and the development of them cannot be fully utilized unless adequate transportation routes are developed.

There is a lack of economic stability in the region. There is high seasonal unemployment and the trade and retail industries experience a general economic slowdown in the winter months. This is partly due to the high dependence on the utilization of natural resources for employment. Further development and utilization of the natural resources will certainly increase employment but will not decrease the seasonality of the industries. Therefore, some degree of economic diversification may be necessary to help stabilize the economy of the region.

In an attempt to address some of the problems stated above, the Panhandle Area Council has identified and listed project priorities. This priority list includes:

1. downtown revitalization of the cities of St. Maries, Tensed, Sandpoint and Bonners Ferry
2. industrial development of the cities of St. Maries and Plummer
3. development of the Silver Valley Corridor for industrial diversification
4. development of an airport at Sandpoint
5. further development of natural resources
6. Kellogg YMCA

Clearwater Economic Planning Area - An Economic Profile

Includes: Clearwater, Idaho, Latah, Lewis and Nez Perce Counties, and also the Nez Perce Indian Reservation

Summary:

Population (1976): 85,000 or 10.2% of state

Population Distribution (1970): 14.2% farm, 44.4% rural non-farm, 41.3% urban

Population Growth Rate (1970-1976): 0.4% average annual rate

Net Migration (1970-1976): 0.37% average annual rate

Land Acres: 8,592,670 or 16.4% of state

Population Per Square Mile: 6.3

Land Ownership: 4% state and municipal, 32% private, 64% federal

Employment (1976): 39,423 or 10.2% of state

Employment Growth Rate: 1.99% average annual rate since 1970

Employment by Industry (1976): 19.2% mining/manufacturing, 9.8% agriculture, 71% residentiary

Per Capita Income (1975): \$4,934 or 95% of state

Unemployment Rate (1976): 6.6%

Employment Participation Ratio (1976): 46.4%

Characteristics:

Agriculture is the major industry in this region. It is the principal winter wheat producing district of the state with barley, dry peas and lentils as other important crops. In addition, livestock sales amount to roughly \$18 million annually.

Lumber and wood products and the processing of wood by-products make up the major manufacturing industries. During the last decade, for example, approximately 50% of the total income in Clearwater, Idaho, and Lewis counties was generated from forest industries. The district also possesses 55% of the state's plywood production capacity.

Significant growth has been realized in trade and service industries with this activity being concentrated in the two growth centers of the region - Lewiston and Moscow. Still, employment in the region is highly cyclical due to the seasonality of the lumber and agriculture industries.

The region has an adequate transportation network. Major highways are U.S. 95 which links north and south Idaho and U.S. 12 which links Lewiston with Missoula, Montana. Pullman-Moscow Regional Airport and Lewiston-Nez Perce Regional Airport serve commercial air services to the region. The Port of Lewiston facilitates trade to the Northwest. An areawide railroad network serves as feeders in Lewiston and Moscow.

Economic Potentials and Problems:

A. Resources

Human resources in the region range from the highly trained technical and professional personnel graduated from the universities and colleges of the area, to the specialized skills possessed by those employed in the timber, lumber and agricultural industries. Natural resources such as forests, agriculturally suited land, water resources, and scenic recreation areas are also in abundant supply. More efficient utilization and employment of all these resources is not only possible but necessary for future economic development.

Other notable resources and potentials of the region include the port facilities at Lewiston with their ability to attract and service new industry; the cultural aspects of the region, especially at Moscow, Lewiston, and the Nez Perce Indian Reservation, and their attractiveness to business and tourists; and finally, the expansion potential of the region's two economic development centers.

B. Problems

While there is economic development potential, there are also problems. There exists a serious conflict over the use of forest lands for wilderness or timber production. Community growth onto prime agricultural land has created conflict. Management and harvest practices of timber on private land must be improved. Existing hydroelectric facilities will not be adequate to supply power needed for future development. The majority of cities and communities in the region need water and/or sewer improvements. Most importantly, economic diversification is necessary to relieve the dependence upon the forest industry and to stabilize highly seasonal employment.

C. Specific Problems

In an attempt to address some of the problems stated above, the Clearwater Economic Development Association has identified and listed project priorities. This priority list includes:

1. central business district revitalization and economic stabilization - City of Moscow
2. north Lewiston industrial park
3. Kamiah industrial park

Natural Resource Ownership and Land Use:

The major natural resources of the region are minerals, lumber and agriculture. Mining activity is largely confined to the Coeur d'Alene Mining District in Shoshone County while the lumber industry is pervasive throughout the region. The agriculture industry is concentrated in the Palouse area near the City of Lewiston. The major land owner in the region is the federal government. Approximately sixty percent of the total land area of the region is under the stewardship of the U.S. Forest Service. Less than thirty percent of the total land area is in private ownership.

Areas with the greatest geothermal potential are located on federal lands. With the exception of only a few sites, the majority of the thermal springs and seeps are located in

the National Forest. Table 3.2.2.1 lists the land ownership and land use statistics for Idaho, Nez Perce and Shoshone Counties. The major thermal resource areas are located in Idaho County where less than sixteen percent of total land area of the county is in private ownership. The thermal areas in Nez Perce and Shoshone Counties are very low temperature resources which are located on either private or municipal lands.

TABLE 3.2.2.1

Natural Resources Ownership and Land Use

	Idaho		Nez Perce		Shoshone	
Ownership: 1977						
Federal Land	4,526,738	8.3%	21,941	4%	1,252,331	75%
BLM	95,630		20,417		73,690	
USFS	4,429,297				1,178,641	
State Land	85,138	1.6%	14,264	2.7%	53,924	3.2%
Private Land	833,194	15.3%	498,927	92.4%	360,350	21.6%
Land Use: 1976						
Urban Land	2,000	.1%	7,800	1.4%	23,500	1.4%
Agricultural Land	233,400	5.2%	265,900	48.7%	1,200	.1%
Range Land	950,000	17.1%	163,200	29.8%	39,000	2.3%
Forest Land	4,265,300	77.6%	104,100	19.0%	1,606,000	96.2%

Population:

There are an estimated 156,225 residents in the entire North Idaho Region. The majority of them live in small communities. The distribution of population in Idaho, Nez Perce, and Shoshone Counties varies for each county. Table 3.2.2.2 lists the significant population facts for these three counties. Except for the low temperature resources found in Nez Perce and Shoshone Counties, the concentration of population is not located near the major thermal areas.

TABLE 3.2.2.2

Population

	Idaho		Nez Perce		Shoshone	
Population	12,929		30,700		18,900	
% Change 70-76	0.3%		1.1%		-4.1%	
% Urban	50%		86%		20%	
% Rural	50%		14%		80%	
Major Cities	Grangeville	3,443	Lewiston	26,547	Wallace	1,886
	Cottonwood	889			Kellogg	3,638
	Kooskia	842			Mullan	1,187
	Riggins	580				

Industrial Economic Activity:

The principal industries in Idaho County are government, lumber, and tourism. Because over eighty percent of Idaho County is National Forest land, the stewardship of that land provides the major job market and economic base. The lumber industry is the second largest economic activity in the county. Mills in the area depend upon National Forest timber, on a sustained yield, for their raw product. Tourism in Idaho County is seasonal with a major slow-down in activity during the winter months.

The economic base of Nez Perce County is split between lumber and agriculture. Lewiston, Idaho, the county seat, is a port city. Barge traffic can navigate the Columbia and Snake Rivers up to Lewiston. The town lies along the interface between the lumber producing interior mountains and the agricultural region of the Palouse Hills. Lewiston is the largest community in northern Idaho and serves as a major retail trade center for the region.

The principal economic activity in Shoshone County is mining. The Coeur d'Alene Mining District is one of the major producers of lead, zinc, silver and gold in the world. Over half of the county's labor force is directly employed in mining related jobs.

Table 3.2.2.3 lists the major manufacturing industries in northern Idaho and their approximate total energy demand.

Of the eleven industries listed, eight are lumber and pulp mills, two are food processing plants, and one plant is an ore smelter. All of these industries are located in areas which have little or no geothermal potential. It would be unrealistic to consider supplying geothermal energy to any of these present industries.

TABLE 3.2.2.3

Total Energy Consumption

<u>Ranking In State</u>	<u>Company & Location</u>	<u>Total Energy Demand (10⁹BTU/yr.)</u>
1	Potlatch Corp. Pulp and Paper Mill, Lewiston	10,000
3	Bunker Hill, Kellogg	4,610
20	Potlatch Corporation Plywood Mill, Pierce	520
21	Potlatch Corporation Plywood Mill, Lewiston	520
22	Potlatch Corporation Plywood Mill, St. Maries	490
23	Potlatch Corp. Particle Board Mill, Post Falls	460
26	Twin City Foods, Inc., Lewiston	380
32	Wicks Forest Industries, Grangeville	300
33	Jones-Normel Foods of Idaho, Inc., Lewiston	270
37	Potlatch Corporation Lumber Mill, Coeur d'Alene	220
38	Diamond International Corp., Coeur d'Alene	210

Industrial Types:

- 1 Ore Smelter
- 8 Lumber and Paper Plant
- 2 Food Processing Plants

Unfortunately, the areas of economic development in north Idaho are not congruent with the major geothermal areas. Some low grade geothermal heat does exist near the industrial centers of Lewiston and Kellogg, Idaho and some moderate temperature geothermal resources are located near the City of Riggins. The major, moderate to high temperature, geothermal areas are located in the National Forest and are isolated by rough mountainous terrain and protected by Wilderness status.

Countywide Energy Demand:

Energy consumption in Northern Idaho is evenly distributed among several types of energy sources. The major indigenous energy resource is wood waste or log fuel. The use of log fuel is commonplace throughout the region's lumber industry.

Natural gas is the major non-transportation related fuel consumed in Northern Idaho. Natural gas is used for space-heating and industrial applications. Table 3.2.2.3 lists the county energy budget and geothermal potential for the region.

Idaho County:

The major industries in Idaho County are lumber and agriculture. Nearly 75% of the total acreage in Idaho County is commercial forest land owned by the Federal government and managed by the Nez Perce and Clearwater National Forest. The economy of this county is directly affected by changes in the national lumber market.

The major concern of the local economy is the lack of access to merchantable timber. Large tracks of land in Idaho County have been withdrawn for inclusion in the Wilderness system or for RARE II study for possible inclusion into the Wilderness system.

Cities in the county have not planned for economic development and are generally dependent upon the stability of local mills. The major goals of economic development district are to lower the seasonal employment of woods workers and stop further division of the family farm. The major impediments to overcome are the lack of industrial diversification and isolation. There are no major economic development or construction activities projected for this area.

The major geothermal areas in Idaho county are located in isolated mountainous areas. Table 3.2.2.5 lists the major thermal springs in Idaho County. The Burgdorf, Cow Flat, and Warren Hot Springs areas have limited potential for local spaceheating of cabins which are largely seasonal homes. The Riggins Hot Springs area is the only major hot spring which has commercial development potential. The majority of the known thermal springs in Idaho County are located within Wilderness areas or in RARE II study areas.

Table 3.2.2.4

County Energy Budgets (1977)

County Name	Hydrocarbon Fuels (10 ⁹ BTU/yr) Consumption						Con- sump. MWH	Pro- duct MWH	Geothermal Potential
	Total	Coal	Oil	N. Gas	Gasoline	Industrial Wood Fuels			
Benewah	1712	330	339	506	538	644	172	0	No known, potential or inferred geo. resources.
Bonner	3407	380	663	991	1373	300	239	1060	No known, potential or inferred geo. resources.
Boundary	1373	154	275	410	533	308	98	0	No known, potential or inferred geo. resources.
Clearwater	3168	818	611	913	827	1124 (924k 300e)	393	0	No known, potential or inferred geo. resources.
Idaho	3069	509	679	1015	866	944 (644K 300e)	287	0	Present consumption of geo. energy is negligible & confined to recreation & small greenhouses. Most geothermal sites in the county are protected by wilderness status or are located in remote regions.
Kootenai	6708	680	1550	2316	2162	2558	483	61	No known potential or inferred geo. resources.
Latah	346	1177	1758	1855	0	0	302	0	No known potential or inferred geo. resources.
Lewis	1045	83	242	362	358		66	0	No known potential or inferred geothermal re- sources.
Nez Perce	10,915	2,820	2,220	3,317	2,558	2800 5600	1,362	53	Limited low temperature resources 20°C well water.
Shoshone	0	747	1,116	1,587			114	0	Mine waste water provides a limited low temperature (20°C) resource.
Totals		6120	8503	12,704	12,657	8678 5600			

TABLE 3.2.2.5

Idaho County Thermal Springs

Site Name Location	Type	Surface Temp	Subsurface Temp	Use Potential
Burgdorf H.S. T. 22 N. R. 4 E. Sec. 18 NW, SW	Springs		45°C	Present use is for recreation Could be developed for local spaceheating of cabins. Nearest major community is Cascade located 40 km west.
Riggins H.S. T. 24 N. R. 2 E. Sec. 14 SE, NW, SE	Springs		41°C	Present use is for a domestic system and a greenhouse. Springs could be expanded to heat large greenhouse or for a fish hatchery. Site is an ideal location for a fish hatchery.
Cow Flats H.S. T. 24 N. R. 4 E. Sec. 7 SW, SE, NE	Springs		59°C	Springs could be developed for spaceheating of local cabins and greenhouses.
Barth H.S. T. 29 N. R. 12 E. Sec. 18 SE, SE	Springs			Wilderness status no potential use
Warren H.S. T. 11 N. R. 11 E. Sec. 24 SE, SW, SE	Springs			Small potential for local heat- ing of cabins. Nearest commu- nity is Cascade located 60 km west.
Jerry Johnson Hot Spring	Springs	48 °C	100°C	Wilderness status. No potential use.
Weir Creek Hot Spring	Springs	47°C	100°C	Wilderness status. No potential use.
Red River Hot Spring	Springs	55°C	95°C	Currently used for recreation and Forest Service campground. Site is very isolated in rough mountainous terrain and there appears to be no development potential.

Approximately twelve hot spring locations are scattered throughout the mountainous Lochsa area of Idaho. All of these springs are venting from Cretaceous granite and have surface temperatures less than 50°C. There appears to be no major geochemical anomalies with these springs. Silica geochemical thermometry indicates 100°C is the highest temperature available at depth. The springs often occur in linear clusters over several kilometers which suggest possible structural control.

The Lochsa area lies totally within the boundaries of the Selway-Bitterroot Wilderness Area. The area is a rugged mountainous region which is totally isolated from human activity. Motorized equipment is restricted in this area and access is limited to foot or horseback along narrow trails. Both the political and economic outlook for this area indicate that geothermal development is not possible. Jerry Johnson Hot Springs and Weir Creek Hot Springs are representative of the typical geochemistry found in the Lochsa geothermal area. Although the discharge of the various springs in the Lochsa area can vary from a few gallons per minute to several hundred gallons per minute, the geochemistry of these springs is very similar.

The Geothermal Steam Act of 1970 was established to provide statutory authority for leasing public lands for the development of geothermal resources. The Wilderness Act was established to preserve and protect certain public lands in their natural condition. Because Congress did not specifically exclude wilderness areas from exploration and development it cannot be construed that Congress intended the destruction of wilderness values by allowing geothermal development of the surface areas. The Congressional purpose for establishing a wilderness system is not nullified by the language of the Act. Nothing in the Geothermal Steam Act expressly authorizes the issuance of leases in wilderness areas, nor is there any specific statement by Congress to indicate their intent to override the prohibition clauses of the Wilderness Act. Geothermal development will not occur in the wilderness system unless Congress repeals the Wilderness Act or determines that wilderness values are subordinate to geothermal needs. The Wilderness Act will be the controlling legislation regarding wilderness areas, superior to the Geothermal Steam Act of 1970.

RARE II Studies:

Several areas in the North Idaho Geothermal Region are presently under study as part of the RARE II inventory. Several roadless areas under consideration for wilderness area status have geothermal potential adjacent to or within the RARE II study areas. RARE II areas with notable geothermal potential are listed in Table 3.2.2.6.

TABLE 3.2.2.6

RARE II AREAS

1. Weir Creek Hot Springs

Location: T 36 N., R 11 E., Sec. 13, Boise Meridian
Discharge: 40 gpm
Temperature: 47.5°C
Aquifer Estimate: 100°C

RARE II Area: #1311, Lochsa Face, (Clearwater National Forest)
No major geothermal potential.

2. Jerry Johnson Hot Springs

Location: T 36 N, R 13 E, Sec. 18, Boise Meridian
Discharge: 300 gpm
Temperature: 48°C
Aquifer Estimate: 100°C

RARE II Area: NF 074, Selway-Bitterroot Wilderness

Protected under present statutes concerning wilderness.

3. Red River Hot Springs

Location: T 28 N, R 10 E, Sec. 3, Boise Meridian
Discharge: 35 gpm
Temperature: 55°C
Aquifer Estimate: 120°C

RARE II Area: Adjacent to #1845, Meadow Creek, (Nez Perce National Forest).

Moderate geothermal potential; area needs to be examined for geothermal energy potential as part of RARE II.

4. Riggins Hot Springs

Location: T 24 N, R 2 E, Sec. 14, Boise Meridian
Discharge: 50 gpm
Temperature: 42.0°C
Aquifer Estimate: 120°C

RARE II Area: #1857, Kelly Mountain, (Nez Perce National Forest)

Area has high geothermal potential, adjacent private land uses hot springs for commercial operations.
RARE II area should be studied regarding its geothermal potential.

5. Burgdorf Hot Springs

Location: T 22 N, R 4 E, Sec. 1, Boise Meridian
Discharge: 162 gpm
Temperature: 45°C
Aquifer Estimate: 120°C

RARE II Area: #4459, Crystal Mountain, (Payette National Forest)

Area is adjacent to resort community of Burgdorf and the hot springs area. Increased recreation growth at Burgdorf could utilize local geothermal area for spaceheating.
RARE II area should be studied as to its geothermal energy potential.

Site Specific Development Potential

Riggins Hot Springs, Riggins, Idaho

- A. Geothermal Resource: Hot Spring
Location: T 24 N, R 2 E, Boise Meridian, Sec. 14, dbc.
Known temperature: 45°C
Best Estimate (subsurface): 120°C
Ownership: Private
Flow rate: 50 gpm
Source: Idaho Dept. of Water Resources Bulletin 30, Part 9, (1979).
- B. Current Energy Demand: (Riggins, Idaho)
- 1) Residential Sector:
Population: 580, Growth Rate 8%
Total Housing Units: 165
Estimated Total Space and Water Heating Energy:
10 X 10⁹ BTU/yr.
 - 2) Commercial Sector:
Number of Establishments: 40
Estimated Total Space Conditioning and Water Heating Energy: 3 X 10⁹ BTU/yr.

- 3) Manufacturing Sector:
One Major Industry: Salmon River Lumber Co.
Estimated Energy Needs: 40×10^9 BTU/yr.
SIC: 2421
Numbers of Employees: 100

Discussion

Riggins Hot Springs is located 12 kilometers east of the town of Riggins. The hot springs are located on an isolated, small alluvial deposit in the Salmon River Canyon. The on-site development potential is limited by available space. The 80 acre site is bordered by the Salmon River on three sides and by a near vertical, 900 meter high, canyon wall on the fourth side. Access to the site is by U.S. Highway 95 to Riggins, then east 12 kilometers along Nez Perce National Forest Road 103 to Allison Creek. The Forest Service road is an all-weather gravel road which follows the north bank of the Salmon River. The hot springs are on the south bank of the river and are accessed by a small private bridge.

Present development of the geothermal potential is limited to a small resort and commercial greenhouse at the site. Except for 640 acres of private land surrounding the hot springs, the remaining land area is owned by public agencies. Most of this land is extremely steep canyon land.

Expansion of the greenhouse operation is handicapped by the shadow effect of the canyon walls. The location has a limited angle of incidence with the sun during the winter months. This limits the productive capabilities of the greenhouses. Any major expansion of the greenhouse operation must consider alternative crops with more tolerance to low light. Present operations have concentrated on tomatoes and flowers.

The market for local produce is limited. Riggins has a population of 580 people and is 80 kilometers from its nearest neighboring community. Two crops appear to be possible alternatives: mushrooms and tree seedlings. Mushrooms require very little light and are presently imported to Idaho markets from California. Tree seedlings could be used locally. Timber harvesting in this region will require extensive replanting in the near future. A local source of tree seedlings would have an economic advantage due to lower transportation cost.

A fish hatchery is also a feasible future development possibility. The location of the Riggins Hot Springs at an accessible area in the Salmon River Canyon makes it an ideal location for future hatchery operations. The Salmon River Drainage is a protected fishery habitat under the authorization of the Bonneville Power Administration. No dams will be built in this drainage in order to provide spawning grounds for the Columbia River salmon fishery. Future growth and increasing

demand for salmon is increasing the need for more hatcheries. The development of a salmon hatchery at Riggins Hot Springs could help meet future salmon fishery needs.

Large scale geothermal development possibilities will depend on future exploration drilling in the area. No exploration is foreseen at this time. If higher temperature fluids (120°C) are developed in significant volumes the market potential is limited by the amount of available space and the isolation of the site. The town of Riggins is a small lumber and resort community. The city could use the geothermal heat for space heating of homes and commercial buildings if the major industry in Riggins, the Salmon River Lumber Company, could utilize geothermal energy for space heating and kiln drying. Development of the geothermal resource for the city of Riggins is considered remote at this time.

Nez Perce County

In describing the economy of Nez Perce County, one must also consider the city of Clarkston and Asotin County, in the State of Washington, since Lewiston and Clarkston and surrounding area tend to form one economic unit.

The lumber industry, including the manufacture of wood, paper, and tissue products, is the major source of employment in Nez Perce and Asotin Counties. The Potlatch Corporation is the largest employer in this area with one of the largest payrolls of any company in the State of Idaho. The Potlatch operation in Lewiston is the single largest energy consuming entity in Idaho. The sawmill and pulp and paper plant consumes over 14 trillion BTU/year of which 50% is energy produced from byproducts at the plant.

Lewiston dominates the commercial life of the District. Approximately 35% of all commercial establishments in the area are located in Lewiston; 48% of the wholesale trade and over 42% of the retail trade occur there; in addition, 60% of the value of all area services are rendered there. Financial institutions in Lewiston hold approximately 45% of the total District's deposits. Lewiston also represents an important health center in the District with its hospitals, nursing homes, and a multitude of health services. Lewis-Clark State College offers educational and employment opportunities and is an important resource serving the District.

The only known geothermal resource in the Lewiston area is the municipal emergency water well which is 20°C. This well does have potential for a heat pump-assisted district heating system. The present city water system could be used to distribute this thermal water.

Site Specific Development Potential

Lewiston, Idaho

A. Geothermal Resource: City well
Location: T 33 N, R 5 E, Sec. , Boise Meridian
Known Surface Temperature: 20°C.
Subsurface Temperature, Best Estimate: unknown, no geo-chemistry
Ownership: Municipal, City Emergency Supply Well
Flow Rate: 1000 gpm.

B. Current Energy Demand

1) Residential Sector:

Population: 31,554, Growth Rate: 3% per year
Total HOusing Units: 10,927
Estimated Total Space and Water Heating Energy:
940 X 10⁹ BTU/yr.

2) Commercial Sector:

Number of Establishments: 1,457
Estimated Total Space Conditioning and Water Heating
Energy: 325 X 10⁹ BTU/yr.

3) Manufacturing Sector:

Number of Companies: 28 (from directory)
Estimated Total Energy Consumed: 845 X 10⁹ BTU/yr.
Estimated Total Energy Consumed by Two Digit SIC
Industries, 20, 24, 26, 28 Consuming Low Process
Temperatures: 674 X 10⁹ BTU/yr. (low process
temperatures are less than 250°F)

C. Major Industrial Energy Needs*:

1) Potlatch Corporation Wood Products and Plywood Mill

SIC: 2436

Energy Use: 3,313 x 10⁹ BTU/yr.

Electrical = 273 X 10 ⁹ BTU/yr.	8%
Natural Gas = 240 X 10 ⁹ BTU/yr.	8%
Hog Fuel = 2,800 X 10 ⁹ BTU/yr.	85%

Process Temperatures: 120°F. to 620°F

Pressure Use: 250 and 125 psig, sat'd.

Current Use: 150,000 lbs./hr., 250 psig
150,000 lbs./hr., 125 psig

Potential for Geothermal Applications: very low

* One-third of this electricity is generated on site. Potential
for geothermal applications: very low.

2) Potlatch Corporation Pulp & Paper Plant

SIC: 2611

Energy Use: $11,368 \times 10^9$ BTU/yr.

Electrical: $1,224 \times 10^9$ BTU/yr., 7.2%

Natural Gas: $4,750 \times 10^9$ BTU/yr., 41.8%

Oil: 202×10^9 BTU/yr., 1.8%

Byproduct Combustion: $5,600 \times 10^9$ BTU/yr., 49.2%
(Black liquor combustion)

Process Temperatures: 110°F. to 520°F.

Pressure Use: 160 & 60 psig, sat'd.
660,000 lbs./hr., 60 psig

3) Twin City Foods Corporation (pea processing)

SIC: 2037

Energy Use: 22.9×10^9 BTU/yr.

Electrical = 10.1×10^9 BTU/yr., 44%

Natural Gas = 12.8×10^9 BTU/yr., 56%

Process Temperatures: 100°F. to 500°F.

Pressure Use: 150 and 100 psig, sat'd.

Current Use: 14,000 lbs./hr., 150 psig

4,000 lbs./hr., 100 psig

Potential for Geothermal Applications: low

Blancher operation is the most compatible to geothermal applications, but local resources are too low in temperature. Need at least 200°F. water.

D. Geothermal/Community Interface:

Potential Geothermal Development: Heat pump-assisted space heating of residential and commercial structures is envisioned using the current municipal emergency water well. This well is 20°C. and capable of producing over 1,000 gpm.

Type of Energy to be Displaced: Electricity, Natural Gas and Fuel Oil

Other Potential Energy Resources in the area: Hydroelectric power, High Temperature Waste Heat

Geographic Barriers: Residential area is uphill from well
Distance from Geothermal Resources to Major Opportunities:
2 miles

Discussion

There is significant potential for industrial waste heat providing all future spaceheating energy needs for the city of Lewiston. Present plants have significantly more waste energy than the community can use. The development of a heat pump-assisted district heating system from the city well seems remote compared to the potential for waste heat district heating.

Shoshone County

Shoshone County is 75.3% National Forest. These forests supply timber to Panhandle mills. A major problem has been the export of timber to Montana for processing because of inadequate roads in the southern portion of the county. The economic potential of the county depends on a greater utilization of natural resources. Current economic development programs have identified the exportation of natural resources as a restriction to local economic growth.

Cities in the county have not planned for economic development and lack local industry. The major goal of the economic development district for Shoshone County is to reduce unemployment by greater utilization of the locally available natural resources. The major impediments to overcome are the lack of planning for industrial diversification and urban development, and the restricted local utilization of available minerals and timber.

The major urban construction projects in the area are the Kellogg YMCA and the Mullan Shopping Mall. Both of these sites are considering utilization of thermal fluids for space heating. The use of this thermal water for space conditioning is dependent upon the use of heat pumps and is restricted by the high amount of suspended solids in the water.

The Kellogg YMCA project involves the construction of a gymnasium and a swimming pool. The Mullan Mall project involves the construction of a small enclosed shopping mall and professional center. Both of these projects are located within 2 to 5 kilometers of 20°C. to 30°C. resources. The geothermal resource is the waste water from the local deep mines. Table 3.2.2.7 lists the known mine waste water of the area.

TABLE 3.2.2.7

Thermal Mine Water in the Coeur d'Alene Mining District

Bunker Hill Mine, Kellogg, Idaho

Average Flow: 1,160 gpm

Temperature of Water: 70°F. at outlet 2 kilometers from town
86°F. one mile below surface

Crescent Mine, Kellogg, Idaho

Average Flow: 190 gpm

Temperature of Water: 90°F. to 100°F.

Morning Star Mine, Burke, Idaho

Average Flow: 700 gpm

Temperature of Water: 84°F., 29°C.

Site Specific Development Potential

Kellogg, Idaho

A. Geothermal Resource: Mine waste water

Location:

Known Temperature: 32°C.

Best Estimate (subsurface temperature): unknown, no
geochemistry

Ownership: Private

Flow Rate: 190 gpm to 1,190 gpm

B. Current Energy Demand:

1) Residential Sector:

Population: 3,811 Growth Rate: stable

Total Housing Units: 1,573

Estimated Total Space and Water Heating Energy:
82 X 10⁹ BTU/yr.

2) Commercial Sector:

Number of Establishments: 328

Estimated Total Space Conditioning and Waterheating
Energy: 68 X 10⁹ BTU/yr.

3) Manufacturing Sector:

No manufacturers located in town

Bunker Hill Smelter is located two miles from town:

Estimated Total Energy Demand: 4,539 X 10⁹ BTU/yr.

C. Major Industrial Energy Needs:

1) Bunker Hill Corporation

Energy Use: 4,539 X 10⁹ BTU/yr.

Electrical: 1,956 X 10⁹ BTU/yr., 43%

Natural Gas: 1,800 X 10⁹ BTU/yr., 40%

Oil: 58 X 10⁹ BTU/yr., 1%

Coal: 720 X 10⁹ BTU/yr., 16%

Process Temperatures over 1,000°F.

Potential for Geothermal Applications: None

D. Geothermal/Community Interface:

Potential Geothermal Development: Heat pump-assisted
space heating of new commercial structures is possible
using thermal mine waste water which is 32°C. Possible
potential for district heating systems.

Type of Energy to be Displaced: Fuel oil

Other Potential Energy Resources in the Area: Waste heat
from the Bunker Hill Smelter could be piped to the
community. Distance is two miles.

Geographic Barriers to Geothermal Resources: None, located
at site of town.

Discussion

The Kellogg community will be building a new YMCA facility in 1980. The possibility of heating this and other structures with heat pump-assisted, low temperature, mine waste water is being considered. Heat pumps lend themselves to district heating concepts. The thermal mine water would be the common factor in a district concept. Since the mine waste water has a relatively stable year-round temperature and flow rate, such a source allows for the flexibility to choose a heat pump design of maximum efficiency.

The basic concept is that even ordinary ground water at 50°F. can be more efficiently used in a heat pump than air. The warmer the water, the more efficient the system will be and the less electrical energy it will consume.

In a district heating system in Kellogg, common piping could be employed to deliver the geothermal water. The cost of installation and maintenance would be mutually shared. Individual users would be tied into a district system in parallel to avoid a large temperature reduction. Each user would tap into a supply mainline and discharge into a return mainline. The major technical limits to such a system in Kellogg would be the flow rates available and the potential for fouling from the water. Minerals in solution and dissolved in the thermal water are major problems associated with using thermal mine waste fluids. These contaminants could create problems in the form of corrosion and deposition and will influence the material selection and design of heating equipment.

Because some of the thermal water in the Kellogg area is of poor quality, a heat exchanger could be installed at the mine. Secondary water would be piped in a closed loop system to individual users and reheated upon return to the heat exchanger. The discharge from the geothermal side (poor quality water) of the heat exchanger would be discharged in a manner similar to the present discharge system.

The economic benefits derived from collectively supplying heat for several users in the Kellogg area could be significant because the annual use factor is high. The area has an elevation of 2225 feet and 6869 heating degree days. The standard 1,800 square foot home in the area has a heat load requirement of 94.2×10^6 BTU/yr. which is very high compared to the rest of Idaho.

A residential space heating system in Kellogg normally operates 60% of the time during the heating season and 20% of the time during the cooling season. A district space heating system would, therefore, be idle 40% of the time during the heating season and 80% of the time during the cooling season.

The system would be enhanced if commercial use can also be found because the load factor would be different from the residential use. A commercial use such as the YMCA which operates during the day-time hours would help augment the district system because the residential sector has its greatest heat requirements during the cold nights.

3.3 Site Specific Development Plans

3.3.1. Candidate Geothermal Sites/Applications

Specific sites which are candidates for Site Specific Development Plans are listed in Table 3.3.1. Site Specific Development Plans apply only to proven and potential resources and to applications that are planned or potential.

Locations selected for Site Specific Development Plans during this year are Weiser Hot Springs, Crane Creek Hot Springs, Bruneau KGRA, and Big Creek Hot Springs. These sites were selected based on diversification of ownership between U.S. Forest Service, Bureau of Land Management, and private resource potential.

TABLE 3.3.1
Candidate SSDP Geothermal Sites

<u>Site</u>	<u>Potential Use</u>	<u>Resource Data</u>	<u>Current Energy Use</u>
Weiser Hot Springs	Industrial Park Space Heating	78°C. Surface 156°C., Na-K-Ca	Site currently used for a natatorium. No major industries in the area. Site located 8 km west of Weiser, Idaho.
Crane Creek Hot Springs	Feed Lot Industrial	92°C. Surface 176°C., Na-K-Ca	No current use, no adjacent communities or industries.
Bruneau KGRA	Feed Lot Industrial	70°C. Surface 140°C., Na-K-Ca	No current use, no adjacent communities or industries.
Big Creek Hot Springs	Electrical Power Generation	93° C. Surface 175°C. Na-K-Ca	No current use, no adjacent industries, isolated.
Sun Valley Ketchum	Space Heating	70°C. Surface 80°C. Subsurface	Space heating currently
Hailey Hot Springs-Hailey	Space Heating	70°C. Surface	Was used until 1978 for spaceheating in Hailey 2 miles east of the Springs.
Twin Falls Coll. of Southern Idaho	Space Heating	130°C. Subsurface (estimated)	Exploration well currently being drilled by the college on the campus.
Preston	Space Heating Industrial	84°C. Surface 250°C. Na-K-Ca	No current use, located close to community and railroad.
Malad	Space Heating	23°C. 133°C. Subsurface	New high school currently under construction will consider geothermal heat.
Pocatello	Industrial	Inferred Resources	Current heavy industrial sites.
Payette	Industrial	Inferred Resources	Current heavy industrial sites.
Nampa	Industrial	Inferred Resources	Current heavy industrial sites.
Caldwell	INDustrial	Inferred Resources	Current heavy industrial sites.

3.3.2 Weiser Hot Springs

Site Specific Development Plan

Preface: Weiser Hot Springs has been identified by the Idaho Department of Water Resources as a potential geothermal resource site with a resource temperature potential between 90° and 140° C. The Idaho Office of Energy has identified this site as a high potential location for developing geothermal resources for industrial applications at a new industrial park. This site has significant potential for locating a geothermal-ethanol hybrid plant and other agricultural processing facilities.

The Weiser Hot Springs site was selected for site specific development analysis because the site has a number of geographical aspects which are critical locational criteria for industrial development. The geothermal prospect is located close to the state's major east-west railroad, a natural gas pipeline, major power transmission lines and the interstate freeway. These support facilities are necessary for industrial development and with the unique combination of a nearby geothermal energy resource, the Weiser site is logical location for a new geothermal-industrial park.

3.3.2.1 Introduction

A site specific development plan is a qualitative and quantitative analysis of technical, economic, environmental and institutional factors which influence the scale and timing of geothermal development. The plan is based on current information available in the literature and reflects the intent of private development interest in the Weiser area. Resource data for the Weiser site was provided by the Idaho Department of Water Resources and the U.S. Geological Survey. A review of all current available socio-economic data and technical papers on geothermal industrial utilization was conducted to determine the types of industrial process which could be supported from local raw products. State policies and local planning reports were reviewed to determine the institutional factors effecting development.

The Weiser Site Specific Development Plan describes the institutional, logistical and economic parameters which will affect the development of a new industrial park based on geothermal energy. The development concept involves locating one or more industrial facilities at the railroad located 16,000 feet south of the proposed well field.

The resource temperatures are expected to range from a minimum of 90° C to a maximum of 140° C. The types of processes considered for the industrial park were based on local and

regional raw products. The types of processing envisioned are: potato starch, ethanol distillation, corn canning and processing, and onion dehydration.

3.3.2.2 Site Description

A) Location:

Weiser Hot Springs is located approximately 6.5 miles west of the town of Weiser, Idaho, in Washington County. Washington County is located in the southwestern part of the State of Idaho. The Snake River flows along its western border and separates the county from the neighboring State of Oregon. Neighboring counties are Adams County to the north, Gem County to the east and Payette County to the south. (see Figure 3.3.2.2)

The Weiser Hot Springs geothermal site is located along the northern margin of a prime agricultural area known as the West Weiser Flat. The site is located two miles north of the Union Pacific Railroad mainline between Portland and Salt Lake City. The principal highway through Weiser is U.S. 95, the major north-south traffic carrier in Idaho connecting Lewiston with Boise. U.S. 30N connects Weiser with I 80N which is located 15 miles west of the community. Figure 3.3.2.3 is a site map of the Weiser Hot Springs geothermal prospect and the potential industrial park.

B) Demographics:

The estimates of the future population of the county and its population centers are made on the basis of past trends. Many changes in circumstances, especially in economic conditions, can change these trends. The local city and county population changes can vary from the experience of a larger area, such as the state. However, the usual situation is for the smaller areas to follow a pattern set by the larger region. The estimates for Washington County are related to the state estimates and assumptions for these are discussed below.

Three estimates, high, medium and low, were made for the population of Idaho until 1990. All of these are based on published estimates made by the Census Bureau.

The projected estimates for Washington County are based upon the medium series of estimates of the state population. Growth in the county is predicted to concentrate in and around Weiser. Generally, small towns, which function largely as supply centers for agriculture, tend to decline as agriculture becomes more mechanized. Midvale and Cambridge will show modest trends. Growth in these small towns depends on factors other than demographic situation. It must be understood that a new industry

FIGURE 3.3.2.2

Site Location Weiser Hot Springs

[illegible]

N4415--W11700/15

1952

AMS 2572 I-SERIES V793

or a better highway system connecting to an area provides a new life for such places.

The population projections (Table 3.3.2.1) are projections of a range of population at ten and twenty-year intervals, 1980-1990, using the 1970 Census as the population base.

In summary, Washington County represents a rural county which will continue to grow, and in this growth will become more urban. The preference for a rural residence will allow for some growth in small towns and country-sides by persons whose incomes are urban-based. The town of Weiser has the greatest potential for industrial development. Table 3.2.2.2 lists the population of the Labor-Drawing area of Weiser, Idaho. Table 3.2.2.3 lists the current statistic concerning labor force within the proposed market area of the Weiser industrial site.

C) Economy of Site Area:

Washington County economic activities were analyzed to provide a working knowledge of the present and past economic base, as well as to estimate the type of future activities which could occur. Washington County has had an increasing economy in terms of total number of persons employed and the percentage of total personal income generated. The Weiser area's economy depends primarily on farm products of various kinds. Principal crops grown include alfalfa, corn, grain, sugar beets, onions, and forage, but livestock production, including range and feed lot operations are the largest income producers.

D) Elements of the Area Economy:

Percent of average monthly unemployment - 1976:

Jan. <u>13.9%</u>	Feb. <u>12.8%</u>	Mar. <u>12.5%</u>	Apr. <u>9.7%</u>	May <u>7.6%</u>	Jun. <u>6.1%</u>
Jul. <u>8.7%</u>	Aug. <u>6.8%</u>	Sep. <u>5.4%</u>	Oct. <u>4.8%</u>	Nov. <u>6.8%</u>	Dec. <u>9.4%</u>

Percent of labor force unemployed: 1970: 5.7% 1972: 7.1% 1975: 10.5% 1976: 8.6%

Month and percentage of highest unemployment: 1975: Jan.-19.1% 1976: Jan.-13.9%

Month and percentage of lowest unemployment: 1975: Oct.- 5.5% 1976: Oct.- 4.8%

Percent of females (16+) in labor force: 1960 (14+): 33.8% 1970: 34.1%

Employment (B.E.A. data)	1967	1970	1974	1975
Total employment	<u>2,703</u>	<u>2,828</u>	<u>3,244</u>	
Farm proprietors	<u>654</u>	<u>631</u>	<u>604</u>	<u>598</u>
Non-farm Proprietors	<u>384</u>	<u>420</u>	<u>454</u>	<u>455</u>
Wage and salary employment:				
Federal civilian	<u>68</u>	<u>49</u>	<u>53</u>	<u>50</u>
Military	<u>4</u>	<u>4</u>	<u>3</u>	<u>3</u>
State & local	<u>373</u>	<u>444</u>	<u>466</u>	<u>501</u>
Manufacturing	<u>71</u>	<u>(D)</u>	<u>395</u>	<u>382</u>
Mining	<u>(D)</u>	<u>(D)</u>	<u>(D)</u>	<u>(D)</u>
Construction	<u>97</u>	<u>56</u>	<u>110</u>	<u>95</u>
Trans., Comm. & Pub. Util.	<u>118</u>	<u>60</u>	<u>60</u>	<u>66</u>
Trade	<u>388</u>	<u>398</u>	<u>573</u>	<u>574</u>
Finance, Insurance & Real Estate	<u>49</u>	<u>51</u>	<u>51</u>	<u>72</u>
Services	<u>202</u>	<u>222</u>	<u>187</u>	<u>190</u>
Other	<u>(D)</u>	<u>(D)</u>	<u>(D)</u>	<u>(D)</u>
Farm	<u>247</u>	<u>244</u>	<u>244</u>	<u>339</u>

(D) Not shown to avoid disclosure of confidential information.

Average Idaho tax return (county) - 1976: \$ 276

Average Idaho tax return (state) - 1976: \$ 396

Total assessed valuation: 1975*: \$ 26,474,276 1976: \$ 26,614,058
 *1974 subsequent rolls, 1975 real and personal rolls, and 1975 utilities.

Average levy county-wide paid per \$100 assessed valuation:
 1975: \$6.81 1974: \$7.25 1975: \$7.38 1976: \$8.51

Sales tax: 1974*: \$ 358,496 1975*: \$400,456 1977*: \$465,574 *Fiscal year

Property tax as percent of full value: County - 1976: 1.61% State - 1976: 1.55%

Per capita income: 1970: <u>\$2,944</u>	1974: <u>\$4,104</u>	1975: <u>\$4,573</u>
% of national average: 1970: <u>74.2%</u>	1974: <u>75.3%</u>	1975: <u>77.5%</u>
% of state average: 1970: <u>89.5%</u>	1974: <u>83.4%</u>	1975: <u>88.3%</u>

Median family income - 1969: \$6,409 Median family income - 1976: \$10,250
 *HUD estimate

Transfer payments (thousands of dollars - county):
 1970: \$3,180 1974: \$5,627 1975: \$6,779

Number of business establishments - 1974: 172

TABLE 3.3.2.1

POPULATION TRENDS AND PROJECTIONS

WASHINGTON COUNTY

Community	Actual Population			May 1976	Projections (1970 Base)	
	1950	1960	1970		1980	1990
Cambridge	354	473	383	451	402	421
Midvale	231	211	176	185	185	194
Weiser	3,961	4,208	4,108	4,607	4,313	4,518
Washington County	8,576	8,378	7,633	8,485	8,337	9,907
*Washington County	8,576	8,378	7,633		7,050	6,700

Source: Idaho Department of Water Resources - Population and Employment
Forecast, State of Idaho, Series 2 Projections 1975-2000

*Bonneville Power Administration Projection

TABLE 3.3.2.2

1970 POPULATION OF THE PRIMARY
LABOR-DRAWING AREA OF WEISER, IDAHO

	Distance	Population	Projected Population-1990
IDAHO			
Adams County		2,877	4,660
Council	70 mi.	899	
Canyon County		61,288	109,900
Caldwell		14,219	
Greenleaf		323	
Melba		197	
Middleton		739	
Nampa		20,768	
Notus		304	
Parma		1,817	
Wilder		748	
Gem County		9,387	16,850
Emmett		3,945	
Payette County		14,390	18,760
Fruitland	16 mi.	2,063	
New Plymouth		968	
Payette	13 mi.	4,521	
Washington County		7,633	13,660
Cambridge		383	
Midvale	28 mi.	211	
Weiser		4,108	
OREGON			
Malheur County		23,169	28,200
Ontario	19 mi.	6,523	
Nyssa		2,620	
Vale		1,448	
Baker County		14,919	17,500
Huntington	21 mi.	580	

TABLE 3.3.2.3

PROPOSED MARKET AREA
WEISER HOT SPRINGS INDUSTRIAL SITE
LABOR FORCE - JULY 1976

IDAHO COUNTIES AND CITIES	Labor Force	Unemployed	Rate	Employed
<u>Adams County</u> Council New Meadows	1,764	146	8.3	1,618
<u>Canyon County</u> Caldwell Greenleaf Melba Middleton Nampa Notus Parma Wilder	36,440	2,680	7.4	33,760
<u>Gem County</u> Emmett	4,581	456	10.0	4,125
<u>Payette County</u> Fruitland New Plymouth Payette	6,714	443	6.6	6,271
<u>Valley County</u> McCall Donnelly Cascade	2,395	171	7.1	2,224
<u>Washington County</u> Cambridge Midvale Weiser	3,456	277	8.0	3,179
OREGON COUNTIES AND CITIES				
<u>Malheur County</u> Ontario Nyssa Vale Adrian	11,785	760	6.9	11,025

E) Previous Industrial Development:

Two major types of industry are currently located in the Weiser area--mobile home and component manufacture, and onion packaging. Three mobile home assembly plants are located at the Weiser Industrial Park producing single and double-wide mobile homes, and solar furnances for mobile homes. Four onion packaging plants operate seasonally out of the Weiser area but are not located at the industrial park. A small insulation manufacturing plant was built in 1977 at the industrial site and is the most recent expansion of the industrial park.

The Weiser Industrial Park is located $1\frac{1}{2}$ miles south of Weiser and is owned by the Weiser Industrial Corporation. The site is located along the Union Pacific Railroad and U.S. Highway 95. Power and natural gas are available at the Weiser Industrial Park as well as unlimited amounts of high quality water. The site is zoned industrial, has fire rating #6, and a tax rate 8.0164/\$100 of assessed valuation. The Weiser Industrial Park is the established center for industrial development for the city of Weiser. There appears to be no local government opposition to establishing additional industrial sites provided such developments are located along the railroad and do not endanger prime agricultural lands.

3.3.2.3 Resource Evaluations

The Weiser Hot Springs site has been utilized for space heating, greenhouses, swimming and balmeological bathing for over two decades. Five shallow, small diameter wells yield enough water at the site of a former hot springs to carry on the above operation.

The U.S. Geological Survey estimates of the Weiser Hot Springs reservoir volume and thermal energies are listed in Table 3.3.2.4. Gravity surveys indicate a low amplitude gravity high in the Weiser Hot Springs area. A magnetic low is also found at the Weiser Hot Springs area. A ground temperature survey made by Idaho Department of Water Resources apparently outlines an area of high heat flow centered at or near the Weiser Hot Springs, and it also correlates very well with high boron concentrations measured in water samples collected in the same survey area. Idaho Department of Water Resources has estimated, by geochemical analysis, that aquifer temperatures range from 141°C to 157°C. Surface water temperature at the Weiser Hot Springs is 77°C.

TABLE 3.3.2.4

U.S.G.S. RESERVOIR VOLUMES AND THERMAL ENERGIES ESTIMATE
WEISER HOT SPRINGS

Mean Reservoir Temperature:	$130 \pm 14^{\circ}\text{C}$
Mean Reservoir Volume:	$4.4 \pm 1.7 \text{ km}^3$
Mean Reservoir Thermal Energy:	$1.38 \pm 0.55 \times 10^{18} \text{ J}$
Estimated Well Head Thermal Energy:	$0.34 \times 10^{18} \text{ J}$
Estimated Beneficial Heat:	$0.083 \times 10^{18} \text{ J}$

Source: U.S. Geological Survey Circular 790, (1978).

3.3.2.4 Exploration Activities

GeoSolar Growers, Inc.

Weiser Hot Springs, Sec. 10, T. 11 N., R. 6 W., Boise Meridian.
An exploration plan has been developed and the principal owners of Weiser Hot Springs, GeoSolar Growers, Inc., are expected to begin drilling program in 1980.

Phillips Petroleum Company

Phillips has drilled four exploration holes in the Weiser area since 1975.

Weiser Stratographic Well #1, 12/9/75
Sec. 32, T. 11 N., R. 3 W., Boise Meridian

Weiser Stratographic Well #2, 1/21/76
Sec. 15, T. 11 N., R. 6 W., Boise Meridian

Weiser Stratographic Well #3, 7/28/76
Sec. 2, T. 11 N., R. 6 W., Boise Meridian

Christensen Well #1, 9/23/77
Sec. 29, T. 11 N., R. 3 W., Boise Meridian

3.3.2.5 Specific Potential Applications

The following is a brief outline of the industrial commercialization possibilities for the conceptualized Weiser Hot Springs Industrial Park. A well program was developed for three possible depths to obtain a realistic range of drilling cost. Three possible distribution systems to deliver the resource to the point of use and the pump and power requirements necessary to deliver the resource were also developed to obtain an estimated deliverable energy cost.

Preliminary calculations were made on the quantity of heat available from the available resources for several process applications. A deliverable resource temperature of 140°C was assumed and potential for use of this resource for corn processing, onion processing, potato starch and ethanol production was investigated.

The results are indicative of potential for application of geothermal energy to agricultural processing. Subsequent to the uses mentioned herein, there is still the potential for a variety of cascade uses, like spaceheating or greenhouses. The exact choice of process or mix of uses requires more specific information, both about the exact nature of the resource and the specific choice of production technology.

I. Costs of Development and Delivery of Geothermal Water

A. Well Program

Three alternative depths. All wells drilled 10" to 160 ft., set 8" casing, then 8" hold with 6" casing to depth. Drilling costs \$2.50/in./ft., increasing \$1 for every 500 ft. of depth.

Casing costs \$1/in./ft.

Well depth:	<u>1,000 ft.</u>	<u>2,000 ft.</u>	<u>3,000 ft.</u>
	32,080 Drill & Case	78,280	140,280
	<u>+ 30% Contingency</u>	<u>+ 30%</u>	<u>+ 30%</u>
Total Cost:	\$41,704	\$101,764	\$182,364
	or	or	or
	\$42/ft.	\$51/ft.	\$61/ft.

B. Transmission Lines

A/C pipe, 10" diameter, insulated with urethane at \$30/ft.

Carries 1,000 GPM to point of utilization from two production wells of 500 GPM each

1. Industrial Park at rail site

$$16,000 \text{ ft.} \times \$30/\text{ft.} = \$480,000$$

2. Straight line to Weiser

$$29,040 \text{ ft.} \times \$30/\text{ft.} = \$871,200$$

3. Weiser via established right-of-way

$$35,640 \text{ ft.} \times \$30/\text{ft.} + \$1,069,200$$

C. Pump size and power requirements

Two wells, each producing 500 GPM. Water pumped from 200 ft. in wells. Friction loss of 2.4 ft./100 ft. in 10" pipe.

$$1. \text{ Pump size HP} = \frac{500 \text{ GPM} \times \text{Head}}{3960 \times .7}$$

$$a. \text{ Industrial park } \frac{500 \times 584}{2772} = 105 \text{ HP}$$

$$b. \text{ Straight to Weiser } \frac{500 \times 896}{2772} = 162 \text{ HP}$$

$$c. \text{ Right-of-Way to Weiser } \frac{500 \times 1054}{2772} = 190 \text{ HP}$$

$$2. \text{ Power requirements KWH} = .746 \times 8760 \times \text{HP} \\ (\text{yearly maximum use}) \quad \text{Price of KWH} = \$.02$$

a. Industrial park

$$.746 \times 8760 \times 105 = 686,170 \text{ KWH} \times \$.02 = \$13,723 \\ \text{per pump}$$

b. Straight to Weiser

$$.746 \times 8760 \times 162 = 1,058,663 \text{ KWH} \times \$.02 \\ = \$21,173 \\ \text{per pump}$$

c. Right-of-Way to Weiser

$$.746 \times 8760 \times 190 = 1,241,642 \text{ KWH} \times \$.02 \\ = \$24,833 \\ \text{per pump}$$

D. Quantity of heat available for use

Calculations assume a 140°C (284°F) resource at two flow levels, the expected 1,000 GPM and a conservative flow of just 750 GPM

	<u>1,000 GPM</u>	<u>750 GPM</u>
$\Delta t = 100^{\circ}\text{F.}$	$4.7 \times 10^7 \text{ BTU/hr.}$	$3.6 \times 10^7 \text{ BTU/hr.}$
$\Delta t = 72^{\circ}\text{F.}$	$3.4 \times 10^7 \text{ BTU/hr.}$	$2.6 \times 10^7 \text{ BTU/hr.}$
$\Delta t = 50^{\circ}\text{F.}$	$2.4 \times 10^7 \text{ BTU/hr.}$	$1.8 \times 10^7 \text{ BTU/hr.}$

II. Potential uses of 140°C. resource

A. Range of possibilities

<u>Temperature</u>	<u>Process</u>
140°C.	Potato starch
130°C.	Ethanol (Distillation)
120°C.	Corn canning and processing
110°C.	Onion dehydration
<u>100°C.</u>	
90°C.	Ethanol (Fermentation)
80°C.	
70°C.	

- B. Below is a list of potential uses of the 140°C. water from the Weiser area. For each potential use we have investigated the: (a) operation period and product demand, (b) temperature requirements, (c) present energy demands, and (d) possible savings from conversion to the geothermal resource.

1. Corn (or other vegetable) processing (See Rocket
Canning Research)

- a. Plants typically operate 60 days a year, 24 hours a day. Plant requires 100 tons an hour of corn in the husk. Peak demand would use 144,000 tons per season.

Washington County and Payette County produced 17,000 tons of sweet corn in 1974. Would need additional sources of supply.

- b. Corn is blanched, then husked, cut and canned in a vacuum. Cans are then cooked in a retort for 20 minutes at about 250°F. to sterilize the product. A 100°C. to 121°C. resource could supply 100% of the energy requirements currently supplied by natural gas.
- c. A large plant requiring 100 tons per hour (Green Giant) utilizes 24.9×10^9 BTU/yr. of electricity and 57.8×10^9 BTUs/yr. of natural gas. A smaller plant producing beans and corn uses 3.4×10^9 BTUs/yr. of electricity and 37.8×10^9 BTUs/yr. of natural gas.
- d. Water temperature of the Weiser resource should be easily sufficient to provide 100% of present gas energy requirements, 57.8×10^9 BTU in the larger plant or 37.8×10^9 BTU in the smaller plant.

Since we are talking about constructing a brand-new plant rather than retrofitting an old one we make the assumption that costs are identical for a new plant, whether it uses geothermal or natural gas. This means the projected savings from a geothermal plant would be equal to the natural gas costs not incurred. Future gas costs are inflated at the rate of increase suggested in Dames and Moore's study for the Idaho Public Utility Commission (slightly over 8%). This future stream of savings from not using gas is then discounted at 10% to find its present value. Table 3.3.2.5 lists gas savings and their present values over a 20-year period for corn processing.

Note: Under provisions of the Energy Tax Act of 1978, Sections 401-404, developers of geothermal properties may deduct intangible drilling and development costs and geothermal deposits qualify for percentage depletion, at the rate of 22% of gross income through 1980 and decreasing 2% a year thereafter. Any reductions in taxable income generated through these provisions would reduce tax liability and represent an additional element of saving to be added to the reduction in natural gas bills.

TABLE 3.3.2.5.

Corn Processing Plant
 5.78×10^5 therms/yr. $\times$ \$.28375/therm = \$164,007

Gas Savings	Present Value (Discounted 10%)
1979 - 164,007	
1980 178,272	162,065
1981 193,786	160,154
1982 210,645	158,261
1983 228,969	156,389
1984 248,887	154,539
1985 270,544	152,715
1986 294,080	150,909
1987 319,669	149,128
1988 345,563	146,552
1989 373,550	144,020
1990 403,808	141,532
1991 436,517	139,088
1992 471,873	136,685
1993 510,097	134,324
1994 551,418	132,005
1995 596,091	129,727
1996 641,354	127,482
1997 696,548	125,280
1998 752,961	123,115
1999 813,939	<u>120,987</u>
TOTAL	\$2,844,957

2. Onion Dehydration (See Oregon Agribusiness)

- a. Plants typically operate 150 days a year, 24 hours per day. Requiring 10,000 lbs./hr. of raw product (Creole or Southport Globe Onions) this makes an annual requirement of 36×10^6 lbs. of raw onions. Based on average Idaho yield of 475 cwt./acre, annual input requirement needs about 775 acres of onions in the vicinity. 1979 estimates of onion acreage in Washington and Payette County total about 2400 acres. There is plenty of product available.
- b. Onions unloaded at the plant are cured in large bins using 100°F. air for 48 to 72 hours before processing. After washing and slicing the onions are transferred to a dryer conveyor where onions are reduced from 83% to 25% moisture by 220°F. air (could be as low as 180°). Onions pass through three more stages of drying to reduce the moisture content to about 4%.

A resource of 110°C. could satisfy 96% of the energy requirement currently supplied by natural gas. Only the last stage, a Bryair dessicator which required 300°F. air, is beyond the bounds of the resource temperature. Geothermal would be used for preheat at this stage.

- c. A plant using 10,000 lbs./hr. of raw product to produce 1500-1800 lbs. of dry product has a total energy requirement of 22 to 26×10^6 BTU/hr., depending on ambient air temperature. With ambient air at 40°F. , this works up to 5.28×10^8 BTU/day or 9.5×10^{10} BTU per 180-day season.
- d. The final stage dessicator, using 300°F. air, is not able to be converted to geothermal, so its $.4320 \times 10^{10}$ BTU would still be supplied by natural gas. The remaining 9.07×10^{10} BTU per season could be supplied by geothermal water. Table 3.3.2.6 lists gas savings and their present value for onion dehydration.

3. Potato Starch (See Oregon Agribusiness)

- a. Plants typically operate September to May on an eight hour a day basis, about 1400 hours per season. Such a plant requires 14 tons per hour of potatoes, mostly low grade and culls, for starch extraction. Based on the average Idaho

yield of 245 cwt, the seasonal input requirement of 3.92×10^7 lbs. of potatoes could be met by the produce of about 1600 acres. Washington and Payette counties combined grow about 400 acres, not enough, but nearby Malheur County of Oregon produces something around 8500 acres. Ample potato acreage seems to be present.

- b. Potatoes are watered and hammered to allow separation of starch from skin and fiber. Centrifugal sieves allow separation of starch milk from the pulp, which is used for cattle feed. After the purified starch is formed into cubes it is flash dried from 45 to 18% moisture content. A resource of 280°F. could supply the 250°F. air needed for the five stage blower drying process.

Reject water at 180°F. could also be put through a heat exchanger to supply all space heating for the plant. The expected resource temperature of 140°C. should be sufficient to meet all energy requirements of the plant.

- c. Space heat load of 1.0×10^6 BTU/hr. and 3.53×10^6 BTU/hr. for the drying process totals 4.53×10^6 BTU/hr. or 6.34×10^9 BTU/season. This is well within the capacity of the two wells with 1000 GPM flow that we have projected.
- d. All energy requirements presently served by natural gas could be replaced with geothermal water at 140°C. The seasonal energy requirement of 6.34×10^9 BTU/season amounts to 6.34×10^4 therms. At an average price of \$.28375/therm, the GS-2 schedule, this works out to a yearly cost of \$17,990 for natural gas. This, and all future gas, would be replaced by geothermal and thus represent gross savings from use of geothermal. Table 3.3.2.6 lists gas savings and their present value for potato starch production.

TABLE 3.3.2.6

Onion Dehydration Plant
 9.07×10^5 therms/yr. $\times$ \$.28375/therm = \$257,361

Gas Savings	Present Value (Discounted 10%)
1979 - 257,361	
1980 279,746	259,315
1981 304,051	251,282
1982 330,547	248,345
1983 359,299	245,406
1984 390,554	242,503
1985 424,539	239,641
1986 461,473	236,809
1987 501,625	234,012
1988 543,075	230,317
1989 586,176	225,996
1990 633,657	222,093
1991 684,985	218,257
1992 740,466	214,187
1993 800,446	210,782
1994 865,287	207,143
1995 935,389	203,568
1996 1,011,124	200,045
1997 1,093,026	196,590
1998 1,181,549	193,193
1999 1,277,237	<u>189,853</u>
TOTAL	\$4,464,637

TABLE 3.3.2.6 (Cont.)

Potato Starch Plant

 6.34×10^4 therms/yr. $\times$ \$.28375/therm = \$17,990

Gas Savings		Present Value (discounted 10%)
1979	-	17,990
1989	19,554	17,776
1981	21,256	17,567
1982	23,105	17,359
1983	25,115	17,154
1984	27,300	16,951
1985	29,676	16,751
1986	32,257	16,553
1987	35,064	16,358
1988	37,904	16,075
1989	40,974	15,797
1990	44,293	15,524
1991	47,881	15,256
1992	51,759	14,993
1993	55,952	14,734
1994	60,484	14,479
1995	65,384	14,229
1996	70,678	13,983
1997	76,403	13,742
1998	82,591	13,504
1999	89,280	<u>13,271</u>
TOTAL		\$312,056

TABLE 3.3.2.7

Ethanol Potential of Weiser Area

	<u>Conversion Coefficients</u>	<u>Acres</u>	<u>Production</u>	<u>Ethanol Production Potential</u>
Corn	2.6 gal./bu.	9,000	157,600 bu.	409,760 gal.
Wheat	"	23,000	813,600 bu.	2,115,360 gal.
Barley	"	12,200	650,600 bu.	1,691,560 gal.
Mixes Grains	"	1,365	73,743 bu.	191,732 gal.
Potatoes	1.3 gals./cwt.	8,783	3,069,237 cwt.	3,990,008 gals.

Sources: Acreage and production from 1978 Idaho Agricultural Statistics for Payette and Washington counties.
Conversion coefficients from University of Idaho, Agricultural Engineering Department.

4. Ethanol Production

- a. The projected plant will operate year-round, 350 days and 24 hrs. per day. Based on the conversion coefficients in 3.3.2.7, production of 1 million gallons of ethanol (our choice of a target size plant) would require 384,615 bushels of corn, wheat, barley, or mixed grains, 769,231 cwt. of potatoes or 45,454 tons of beet sugar. The Weiser area already has sufficient quantities of these products available to generate 1 million gallons of ethanol.
- b. The temperature requirements for fermentation and distillation range up to 100°C., which is easily within the capabilities of the expected resource.
- c. Energy requirements for 1 million gallons of ethanol are based on an assumed heat requirement of 25,000 BTUs per gallon, a total of 2.5×10^{10} BTUs per year. The most modest estimates of the heat content of the projected water flow from two production wells are considerably greater than the heat required for an ethanol plant of this size.

- d. The heat requirements could easily be 100% satisfied by 140°C. geothermal water, completely erasing the cost of natural gas. Table 3.3.2.8 for gas savings and present value calculations over the next 20 years.

TABLE 3.3.2.8
Ethanol Plant
250,000 therms x \$.28375/therm =

Gas Savings		Present Value (Discounted 10%)
1979	\$70,937	
1980	77,108	70,098
1981	83,818	69,271
1982	91,110	68,452
1983	99,035	67,642
1984	107,650	66,842
1985	117,018	66,054
1986	127,198	65,273
1987	138,265	64,502
1988	149,465	63,388
1989	161,570	62,292
1990	174,658	61,217
1991	188,805	60,159
1992	204,098	59,120
1993	220,630	58,099
1994	238,503	57,096
1995	257,825	56,110
1996	278,700	55,139
1997	301,275	54,187
1998	325,675	53,250
1999	352,050	<u>52,330</u>

TOTAL \$1,230,521

3.3.2.6 Development Process

A. Financial Factors:

GeoSolar Growers, Inc. of Weiser, Idaho, are the principal private investors in the Weiser Project. No federal funding, other than outreach assistance, has been involved with this project. The major goal of GeoSolar Growers is the establishment of an industrial park. This group currently is operating a small natatorium and aquaculture project at the site. Interest in developing an industrial park is currently focused on establishing a geothermal-ethanol plant in the area.

GeoSolar Growers did apply for a PRDA grant in 1979 but the application was rejected. The group has had its principal management contractor, Integrated Energy Systems, Inc. of Boise, Idaho, consult with DOE on other possible funding mechanisms such as the Loan Guarantee Program.

B. Land Leasing:

GeoSolar Growers, Inc. owns the land area surrounding Weiser Hot Springs. There are no federal or state lands involved in this development.

C. Permitting Requirements for Geothermal Development:

1. An approved permit from the Department of Water Resources is generally required before work can begin on geothermal wells. The permit forms required under the Geothermal Resource Act are:
 - a) Form 4003-1, Application for Permit to Drill for Geothermal Resources;
 - b) Form 4003-2, Application for Permit to Alter a Geothermal Well;
 - c) Form 4003-3, Application for Permit to Convert a Well to a Geothermal Injection Well;
 - d) Form 4005, Geothermal Resource Surety Bond;
 - e) Form 4007, Notice of Intent to Abandon a Well;
 - f) Form 4009, Report of Abandonment of a Well
2. Permit applications must be accompanied by a filing fee of:
 - a) One hundred dollars (\$100) for any production or exploratory well;

- b) Fifty dollars (\$50) for an injection well;
 - c) Fifty dollars (\$50) for an amendment to a permit;
 - d) No filing fee shall be charged for filing a Notice of Intent to construct a hole for gathering geotechnical data.
3. Bonds are required as a condition of every permit. A bond of not less than ten thousand dollars (\$10,000) is required for each well.
4. The two exemptions to the Geothermal Resource Permit requirements relate to exploration wells and to low temperature geothermal wells.
- a) If an exploration well is less than six inches in diameter and less than 1,000 feet deep and is used only for collecting geotechnical data, the owner must simply file a Notice of Intent to drill with the Department of Water Resources.
 - b) As explained in Section 42-0003(e), Idaho Code, wells from which low temperature water is used for such purposes as space heating or fish propagation need only obtain an approved water right.
5. Although a water right is not required under the geothermal permit, it is highly recommended that water rights be applied for in order to obtain assurances against subsequent developers.

D. Local Government Permits: (Washington County)

County Planning & Zoning Permits: Change of zoning needed.
County Highway Department: Right-of-Way permits required.
Weiser City Zoning Permit: Change of zoning needed.

E. Time Factors for Permits:

Idaho Department of Water Resource permits can be issued in less than four weeks but can take up to six months. Contested water right permits can take six months to one year to resolve. Planning and zoning permits take from one week to two months for issuance.

F. Barriers to Development:

Construction and operation of an ethanol distillation plant requires a license from the Regional Regulatory Administration, Bureau of Alcohol, Tobacco, and Firearms. Under the current laws there is no difference between making alcohol for gasohol and making alcohol for liquor, therefore the permit requirements are quite detailed.

Disposal of the geothermal fluids after processing may pose environmental problems. Three types of disposal are being considered: biomass enrichment, surface disposal in irrigation canals and injection. GeoSolar Growers are currently investigating the feasibility of using the waste fluids as a growth medium for biomass product to be used in the ethanol plant. This process is expected by the developers to consume the majority of the waste fluids from the ethanol plant. High concentrations of boron are found in the Weiser Hot Springs water and injection may be the final disposal of these solutions.

Because of the fact that about 70% of the production cost of ethanol depends on the price of farm crops, gasohol plants could be victims of the variations in the farm markets. Venture capital investors and bankers will recognize this fact, and will probably judge gasohol as a higher risk than investments in oil, gas and other risk ventures. The investment capital and debt financing may be difficult to obtain without some sort of guarantee. GeoSolar Growers hopes to alleviate the supply problems by developing biomass in the waste fluid medium and using a mix of raw products from local agriculture to supplement their own product supply.

Currently the production of ethanol and gasohol is not profitable. A considerable rise in the price of gasoline is necessary to make ethanol profitable. New techniques would alter this problem very little, but byproduct sales of protein and CO₂ may help the economics. How much of a price rise is needed for gasoline and when it is likely to occur are pieces of information which are basic to determining when and if gasohol will be economically feasible.

There are fifty established water rights within ten miles of the Weiser Hot Springs site. The deepest well is 350 feet and is used for irrigation. The majority of these wells are domestic use wells. These shallow aquifer water rights must be respected and any deterioration of water quality or availability could hinder development.

Figure 3.3.2 is a conceptual timeline for project development.

3.3.2.8 Summary and Recommendations

The Weiser site has considerable potential for developing a geothermal industrial park. The Weiser Hot Springs geothermal area has excellent location with respect to transportation and utility corridors. The area has abundant agricultural production and could supply the raw product needs of the types of processes outlined in this report. Development interests, who are working without Federal assistance, are currently studying the feasibility of a geothermal-ethanol plant at this location.

Better funding mechanisms are needed for direct application projects to obtain risk capital for exploration. Also, a loan guarantee program is needed for construction of a hybrid geothermal-ethanol plant. A prototype plant is needed to demonstrate the feasibility of geothermal-ethanol production.

3.4 Time Phase Project Plans (TPPP)

3.4.1 Active Geothermal Demonstration/Commercialization Projects

There are five active geothermal development projects in Idaho. They are located at Raft River, Boise City, Rexburg, College of Southern Idaho and Ketchum. The Raft River geothermal project is a DOE electrical generation project located near Malta, Idaho. The Raft River project is not covered in the Time Phase Project Plans. A time phase plan for Raft River has been developed by E.G. & G. Idaho, Inc. and is published in the Department of Energy Projects Management Plan for Raft River Pilot Geothermal Power Plant. The Boise Geothermal TPPP is discussed in detail in Section 3.4.2 of this report. A TPPP for the City of Rexburg is currently being researched.

Time Phase Project Plans for the College of Southern Idaho, located in Twin Falls and for Ketchum will not be developed until there is a change in the current status of those projects. The College of Southern Idaho geothermal project is in the early exploration drilling phase. A decision on geothermal retrofit will be made pending the results of the exploration drilling. The Ketchum geothermal district heating system has serviced up to 40 customers since the 1930s. The current owners have no plans to improve or expand this system.

Figure 3.3.2.4 Conceptual Timeline for Project Development, Weiser Hot Springs.

Completed - Six months -two months - twelve months - twelve months -

3.4.2 Boise Time Phase Project Plan (Summary)

3.4.2.1 Introduction

The function of the time phase project plan is threefold: 1) the Plan shows the complexity of historical actions which have brought the Boise Geothermal Project to its present state; 2) the Plan also shows what tasks must be completed and the projected timetable for the task necessary for the Boise Geothermal Project to come on line by the 1983 projected completion date; 3) an economic analysis of the price of the geothermal water is also included in the plan. The following information is a summary of the project tasks which have been accomplished and need to be accomplished. Figure 3.4.2 illustrates the timetable for the project plan. The complete Boise Time Phase Project Plan is available from the Idaho State Office of Energy.

3.4.2.2 Historical Task Tracking

The historical chronology begins with then-Governor Andrus requesting aid from the Energy Research and Development Administration to determine the feasibility of supplying the State Capital Mall with geothermal fluids for space heating. The Idaho National Engineering Laboratory completed a design and cost analysis study on retrofitting the Capital Mall and conducted exploration drilling in the Military Reserve Park area. The resulting report to the Governor concluded that no major resource or engineering difficulties exist that would prevent the project from being completed. The report did recommend further research through a demonstration project.

Governor Andrus then obtained funds from the Pacific Northwest Regional Commission for a demonstration project. The PNRC project has resulted in two major state office buildings, the Idaho Agriculture Health Laboratory and the Department of Agriculture Building, being successfully heated with geothermal heat. A third building, the Labor and Industrial Services Building, is currently being studied for retrofit to geothermal heat under the PNRC sponsored program.

The original INEL study also stimulated involvement of the City of Boise which conducted two years of development study and planning under grants from the Energy Research and Development Administration. These studies resulted in a joint application by the Warm Springs Water District and the City of Boise for a grant from the Federal Department of Energy to cost share an extensive expansion of the geothermal district heating system. The new Boise geothermal project would heat the Capital Mall, the Central Business District and expand the residential system. The Boise Time Phase Project Plan lists the historical and projected tasks that are necessary for a successful completion of this project. Figure 3.4.2 displays these tasks as a function of time and shows the interconnections between the various tasks.

3.4.2.3 Projected Task Tracking

A number of institutional and logistical tasks will be necessary over the next three years in order to complete the geothermal project by the projected 1983 date. Three major development activities must occur in a parallel sequence between now and 1983: 1) The retrofit of the Capital Mall, 2) The rebuilding of the Warm Springs Water District System, and 3) The construction of the Boise City geothermal system.

3.4.2.4 Capital Mall Retrofit

The State of Idaho first initiated a program to assess the geothermal heating potential in 1973. The initial studies resulted in two exploration wells, a retrofit engineering study and a pilot demonstration. The completion of the Capital Mall geothermal project depends upon the timeliness of the construction process over the next three years.

In February, 1979, the Idaho Legislature appropriated \$190,000 to retrofit the Capital Mall to geothermal heat. In order for the retrofit to begin by 1981, the State must start its administrative procedures by October, 1979. The first major action by the State would be a request for proposals to complete the necessary systems engineering. This will require the approval of the Permanent Building Fund. This action could take up to four months to complete. The actual engineering and systems design could be completed within eight months of the contract date. A major result of this study will be a more exacting cost estimate.

With a more definitive cost estimate, the Department of Administration, Division of Public Works, could, if necessary, request additional funds from the Permanent Building Fund for the Capital Mall Retrofit. This action would require legislative approval. The engineering and cost estimate study must be completed by October, 1980, in order for additional funding requests to be included in the 1981 budget appropriation.

The actual retrofit construction must occur during the warmer spring and summer months. The construction period should occur sometime between April and November, 1981. Because of the size of the project and the design of the present heating system, it is realistic that only half of the Capital Mall would be retrofitted during the 1981 construction season. The remaining buildings would be retrofitted during the 1982 construction season. This would bring the entire Capital Mall "on-line" during the 1982-83 heating season.

The projected cost of heating the Capital Mall with natural gas for 1982 is \$272,156. The estimated operation cost for the geothermal heating system for the same period at \$.878/100 cf. of water is \$213,202. When the amortized retrofit cost of \$20,841 is included, the yearly cost savings to the State is estimated at \$38,113.

By retrofitting to geothermal heat, approximately 774,036,000 cubic feet of natural gas per year will be conserved. This is equal to 13,362 barrels of oil per year or the water and space heating needs of approximately 500 homes in Idaho. By the year 2001, natural gas savings will have totaled 14.7 billion cubic feet of gas which is equal to 253.4 million barrels of oil.

3.4.2.5 Warm Springs Water District Rehabilitation

The Warm Springs Water District owns its facilities. These include the two existing geothermal wells, pumps, associated controls, geothermal pipeline, valves and distribution piping. Major portions of this system are over forty years old. The entire system will be rehabilitated over the next three year period. The rehabilitation program will include refurbishing the existing wells and pumps and replacing the present main transmission line.

The rehabilitation of the Warm Springs Water District will begin with the rebuilding of the current production wells and the drilling of a third production well. Refurbishing and expanding the Warm Springs Water District wells is projected to occur in the summer months of 1979. The new wells should be on line by October, 1979, in time for the heating season. Construction of the new pipeline will begin the following spring in April of 1980. This activity must be completed by October, 1980, in time for the heating season. Rehabilitation of auxiliary lines and construction of new expansion is expected to occur during the summer months of 1981 and 1982.

3.4.2.6 Boise City Geothermal System

The unified development of the Boise geothermal resources will include the development of a new well field and distribution system by the City of Boise. Development of this system should occur in parallel with the retrofit of the Capital Mall and the rehabilitation of the Warm Springs Water District. It is the city geothermal system which is projected to deliver thermal water to the Capital Mall. The timeliness of the Capital Mall retrofit is based on the projected construction schedule of the Boise City Geothermal System.

The construction of the Boise City geothermal system will begin in the fall of 1979 with the drilling of two production wells. The production drilling is projected to occur between November, 1979, and March, 1980. This drilling activity should begin as soon as the Warm Springs Water District drilling is completed in October, 1979. This will allow for continued operation of the drilling rig without interruption which will keep mobilization cost to a minimum. The drilling of injection wells for a disposal system is projected to begin in April, 1980, as soon as the drilling equipment is available from the production drilling phase. The disposal wells will serve both the Warm Springs Water District and Boise City geothermal systems.

Pipeline construction is projected to occur in two phases. The first phase will involve the construction of the pump station and main service line to the Capital Mall and the Central Business District. This phase is expected to begin by June, 1980 and continue through November, 1980 when winter weather could slow construction. The second phase of construction is projected for the spring of 1981. Construction should begin by March, 1981 and be completed by October, 1981. Phase II construction will include connecting buildings to the system and interconnecting the Boise mainlines and disposal lines with the Warm Springs Water District lines. The combined mainlines would serve the Central Business District. Waste water pipelines from both systems are interconnected to common disposal wells.

3.4.2.7 Critical Parallel Task

A timely unified development of a Boise geothermal district heating system depends upon parallel completion of several critical tasks by the State of Idaho, the City of Boise, and the Warm Springs Water District. Critical to the timetable for retrofit of the Capital Mall is the expected delivery date of the Boise City geothermal system. The state could begin the engineering and construction process as early as October, 1979. The incentive for an aggressive retrofit program by the State is an early target date for delivery of geothermal water. Based on a projected delivery date of summer, 1981, the State must begin bid request for engineering by October, 1979, in order for retrofit construction to be completed by the delivery date.

Critical to the timely completion of both the Warm Springs Water District and Boise City geothermal projects is the coordinated planning of drilling activities. Drilling activities

should be scheduled such that when drilling has been completed at one site, the rig can be immediately moved to the next location.

The Warm Springs Water District wells are projected to be refurbished first. Drilling activity at the District's well field must occur during the summer months to minimize the inconvenience to present customers of the District. A third production well will be drilled after the old production wells are refurbished. Drilling by Warm Springs Water District should be completed by November, 1979.

Upon completion of drilling at the District's well field, the drill rig could then be moved to the site of the Boise City well field. Drilling at this site could continue through the winter. Successful completion of the Boise City wells should occur by March or April, 1980. The drilling would then be moved to the site of the injection wells. Completion of at least one injection well must occur by September, 1980, in order to inject fluids from the refurbished Warm Springs Water District system.

The projected drilling program calls for drilling three new production wells, the refurbishing of two current wells, and drilling two injection wells at three well field locations over an 18-month period. Well depths of approximately 1,500 feet are anticipated for production wells and 1,000 feet for injection wells. Planned coordination of the drilling program will reduce cost due to delays and reduce the mobilization and demobilization cost of drilling.

3.5 State Aggregation

3.5.1 Present Commercial Activity

Though there is great potential for the direct use of geothermal energy throughout Idaho, to date there has been only modest development generally confined to localized space heating of greenhouses, swimming pools, and a few buildings. To date, the largest utilization of geothermal energy has been for the Warm Springs Water District in Boise. Here geothermal waters have been used as a private utility since the 1890s to space heat several private homes along Warm Springs Avenue.

The Idaho Agricultural and Health Department is presently space heating its 35,000 square foot laboratory building with geothermal waters. The interior of the building maintains 72°F. room temperature by utilization of a 170°F. geothermal well within 2,000 feet of the laboratory. A large project to heat several state government office buildings, including the State Capitol, has been engineered and planned over several years. Construction of pipelines and retrofitting present heating systems has reportedly begun.

The D.O.E. has recently awarded two PON geothermal demonstration projects in Idaho, to the City of Boise and to the Madison County Energy Commission and Rogers Foods, Inc. The Boise project is for development of a large-scale space heating system for several commercial buildings in the downtown area and homes in the Warm Springs Water District of Boise. The Madison County project is to use geothermal energy for municipal space heating and industrial food processing.

3.5.2. Potential Sites

The potential for geothermal direct use development in Idaho is extensive. Over eighteen cities in the state have expressed an interest, and/or plans, to utilize geothermal energy in the near future. A few of these cities include Weiser, Boise, Twin Falls, Mountain Home, Rexburg, and others.

Future industrial utilization of geothermal fluids, particularly for food processing, could account for over five trillion BTUs/year of direct energy supply. Commercial and residential utilization of geothermal resources in Idaho could exceed 2378×10^9 BTUs/year by 1985, and by 1990 geothermal space heating could exceed 4134×10^9 BTUs per year. At this rate geothermal energy in Idaho could supply over ten trillion BTUs/year of direct heat utilization by the year 2020. Site specific projections of potential direct use geothermal development are included herein.

TABLE 3.5.2
PROJECTED GEOTHERMAL DIRECT USE DEVELOPMENT

<u>Site (County)</u>	<u>Use</u>	<u>Reservoir</u>	<u>Projected Development (10⁹ BTUs/yr.)</u>
Garden Valley (Boise)	Residential S.H.	proven	50
Cascade (Valley)	Residential & Commercial S.H.	potential	400
Kelly Hot Springs (Ada)	Commercial S.H.	proven	2.5
	Industrial S.H.	proven	13
	Residential S.H.	proven	198
	Schools S.H.	proven	11.6
Penitentiary Grounds (Ada)	Commercial (state)	proven	225
Warm Springs Water District (Ada)	Residential	proven	582.4
Boise Barracks (Ada)	Public Buildings	proven	101.9
Capitol Mall (Ada)	Public Buildings	proven	196
Camels Back Park (Ada)	Residential	proven	488
Boise Central Business District (Ada)	Commercial	proven	664.2
West Boise (Ada)	Residential	proven	521
Nampa & Caldwell (Canyon)	Industrial	inferred	1777.5
Mountain Home KGRA (Elmore)	Industrial	potential	200
Mountain Home Air Force Base (Elmore)	Space Heating	inferred	651
City of Mountain Home (Elmore)	Residential S.H.	potential	50
Payette County	Industrial	inferred	400
Bruneau KGRA (Owyhee)	Industrial	potential	250
Castle Creek KGRA (Owyhee)	Industrial	potential	150
Givens Hot Springs (Owyhee)	Space Heating	potential	50
Weiser Hot Springs (Washington)	Industrial	potential	250
	Residential S.H.	potential	100
Raft River KGRA (Cassia)	Industrial	proven	250
College of Southern Idaho (Twin Falls)	Space Heating	potential	25
City of Twin Falls (Twin Falls)	Industrial	inferred	670
City of Buhl (Twin Falls)	Industrial	inferred	160
Hailey (Blaine)	Space Heating	potential	25
Ketchum-Sun Valley (Blaine)	Space Heating	potential	50
Soda Springs (Caribou)	Space Heating	inferred	25
Chubcock (Bannock)	Residential S.H.	potential	50
	Industrial	potential	200
Lava Hot Springs (Bannock)	Commercial S.H.	proven	25
Preston (Franklin)	Industrial	inferred	200
Rexburg (Madison)	Space Heating	inferred	500
	Industrial	inferred	200

3.6 Institutional Analysis

3.6.1 Legal Overview of Geothermal Resources in Idaho

Introduction:

The most significant impact of geothermal resource development in southern Idaho will be the effect on water. Any geothermal resource development in Idaho will involve some form of consumptive utilization of thermal waters for energy conversion. The potential for discord between geothermal development and water resources is considered the most critical legal conflict facing future geothermal resource development in Idaho.

The State of Idaho recognizes the unique nature of geothermal resources with respect to water and has declared the geothermal resources of the state to be "sui generis". The "sui generis" designation classifies geothermal resources as being neither water nor mineral resources but closely related to and possibly affecting and affected by water and mineral resources. In order to control any possible conflict between geothermal utilization and state water appropriation, the regulatory powers of the state Geothermal Resource Act were placed in the Idaho Department of Water Resources.

GEOTHERMAL RESOURCE ACT:

Under the Idaho Geothermal Resource Act, any private owner, or holder of a state or federal geothermal lease must first apply to the Director of the Idaho Department of Water Resources for a geothermal resource well permit, before he can drill or alter any well for exploration or production purposes. A filing fee of one hundred dollars (\$100) for a well and fifty dollars (\$50) for an injection well is required with all permit applications. The permit must be secured before drilling can occur.

As a condition of every permit, a bond, indemnifying the State of Idaho is required. The bond, which is not less than ten thousand dollars (\$10,000) for each individual well, must be posted to provide sufficient security conditioned upon the performance of the duties required by the Geothermal Resources Act.

An application for appropriation of public waters must also be made if the proposed well will involve the use of water in the construction or operation of a geothermal well. For example, water that would be used in drilling a well or used to stimulate a hot but dry well would have to be appropriated from some other source. An application for appropriation must also be made if the geothermal well will yield water that will have a beneficial use. Any consumptive use of geothermal water will require appropriation.

If the geothermal well yields water that is used as a "mineral source, an energy source, or as a material medium", an appropriation of public waters is not required. Geothermal resources which can be developed as an energy source, a mineral source or as a material medium, are usually dependent on high temperature geothermal reservoirs. Temperatures hot enough for electrical power generation (above 150°C.) can be found beneath Western Snake River Plain at depths of 3-4 kilometers. Fluids at these depths are sui generis and would be high temperature, high pressure and often highly mineralized. Fluids at these depths are not normally associated with the developed groundwater. In addition, high temperature fluids may be encountered at shallower depths, if suitable convective reservoir systems are present. Shallow, high temperature fluids are known to exist in several locations in southern Idaho, particularly in the Raft River Basin. These high temperature geothermal fluids are directly related to developed regional groundwaters.

High temperature geothermal fluids, developed as an energy source, a mineral source, or as a material medium are exempt from applications to appropriate water if they will not affect any source of developed underground water. A geothermal resource permit will not be issued if the operation of any well, under the proposed permit, will unreasonably decrease the groundwater available for prior water rights. The burden of proving the interdependence between geothermal sources and prior groundwater rights is with the state of Idaho. The geothermal resource permit will be denied until a valid water appropriation permit has also been obtained.

The statutory intent is to regulate tightly geothermal development which could interfere with a prior appropriation of water. The potential for such a conflict is quite high when considering shallow geothermal sources. Sources of geothermal fluids from depths deeper than two kilometers are generally high temperature sources and could be considered undeveloped and thus unappropriated waters. There would be little difficulty in obtaining an appropriation permit for such deep thermal waters on the grounds of the constitutional guarantee of the state of Idaho, that the appropriation of the unappropriated waters of the state shall not be denied.

In the state of Idaho, any state, private, or federal geothermal operator must obtain a valid geothermal resource permit from Idaho Department of Water Resources before any drilling operations can begin. The prudent geothermal developer in the state of Idaho would be wise to obtain a permit to appropriate deep, high temperature, fluids used as an energy source. This would guarantee him a prior appropriation of the newly developed water source. The acquisition of a valid water right for a geothermal development appears to be the current interpretation for the administration of this act.

Certainly specific types of geothermal resource utilization are specifically excluded from geothermal resource permit requirements.

"No person operating or proposing to operate a geothermally heated greenhouse, hothouse, swimming pool, hot springs bath, or hot water fish propagation facility, space heating plant or similar facility unless such operation is in conjunction with a geothermal resource use not specified in this subdivision, shall be compelled to comply with the geothermal resource permit requirements under this act if such person obtains a valid water right permit for such operation."

The operations mentioned above are low temperature uses of geothermal resources. Low temperature thermal waters (80°C. - 140°C.) with potential for space heating and other low temperature uses are common shallow ground water resources in southern Idaho. Under this part of the Idaho Geothermal Resources Act, any irrigation well which contains thermal water and a valid water right could develop a geothermal heating project without a geothermal resource permit.

Presumably, drilling and development of low temperature thermal wells for any of the above geothermal operations will be regulated by the groundwater appropriation laws and water well drilling regulations of the state of Idaho.

If the operation of a low temperature utilization method is in conjunction with a geothermal resource use not specified under this part of the state act, then the operation is regulated by the geothermal resource permit regulations. Secondary developments, associated with higher temperature developments would be governed by the permit regulations of the Geothermal Resource Act. Thus, any high temperature geothermal resource developed for an energy source which also develops a secondary use beyond the primary energy use, would fall under the appropriation clause of the Act.

The implication of the exemptive clauses of the Idaho Geothermal Resource Act is that low temperature geothermal utilization only requires a valid water right permit and such operations would be regulated by the appropriation laws of the state. Higher temperature utilization for an energy source or mineral resource requires a geothermal resource permit, but does not require a water right permit. This latter point is only valid if the well will not interfere with other groundwater users. Conjunctive developments of high and low temperature uses from the same geothermal resource well would require both a water right permit and a geothermal resource permit.

Although many low temperature uses do not require a valid geothermal permit, such operations can acquire one. Likewise high temperature geothermal operations developed as an energy source, a mineral resource or a material medium do not require a valid water right permit, but such operations can acquire such a permit. A prudent operator would be wise in obtaining both permits for additional protection from third party interference and for avoiding potential conflicts with state agencies. A problem with applying for both permits is that performance bonds, and application fees are required for each.

APPROPRIATION DOCTRINE:

Under the general concept of the appropriation doctrine, the individual water user has a guaranteed right to the continued use of water based on the date of his first use of the water. The measure of his certainty to an adequate water supply is his priority date. The appropriation doctrine is the basis of water law in the Western United States. In the state of Idaho, the appropriation doctrine included the administration of groundwater resources.

Idaho has had a comprehensive Groundwater Act since 1951. Under this act "the right to groundwater may be acquired only by appropriations." There is no distinction in the Groundwater Act between categories of groundwater. Under this statutory framework, a water right is acquired by diverting the water and applying it to a beneficial use.

The acquisition of groundwater rights in the state of Idaho is through a permit system supervised by the Idaho Department of Water Resources. Under the permit system, any person intending to appropriate water must apply for a permit prior to commencing work on the diversion and distribution facility. The Department then publishes notice and if anyone files a protest against approval of the application, a hearing must be held. The state can deny a permit or grant one for a lesser quantity of water only under the following conditions.

- 1) if the proposed use is such that it will reduce the quantity of water under existing rights.
- 2) if the water supply itself is insufficient for the purpose for which it is sought to be appropriated
- 3) if it appears to the satisfaction of the Department that such application is not in good faith.
- 4) if the applicant has not sufficient financial resources with which to complete the work involved

After the diversion has been completed and the water put to a beneficial use, a license is granted. The priority of the water right begins on the date the application for an appropriation permit was filed.

The point here is the difference between developed water and appropriated water. Water that is used in the construction of a geothermal well or water that is injected to develop a geothermal system would have to be derived from another source. This would require an appropriation for that purpose. Thus a permit to construct a geothermal well of this nature would be dependent upon both a water appropriation permit and a geothermal resource permit. If the particular system involves the extraction of high temperature water for the purpose of mineral or energy extraction, that water will be considered non-tributary water or developed water, providing that such would not be available for use, except through the exertion of development of the geothermal resource. The developer of the water would create a water source and under the appropriation doctrine would be given free rein of disposition of this water provided that no other appropriator could be injured by this action. The geothermal permit does not guarantee the operator a water right to the created water. If the operator wishes assurance against subsequent developers, he would be wise to acquire an appropriation license as prima facie evidence of a water right. The geothermal resource permit gives the operator the right to construct a geothermal well and extract the energy or minerals found therein. Anyone diverting water and applying it to a beneficial use without a permit acquires no rights to that water under the mandatory permit system of water appropriation in the state of Idaho.

The Idaho Groundwater Act seeks to promote "full economic development" of the state's groundwater resources. The full economic development of groundwater is consistent with the constitutional policy of promoting optimum development of the state's water resources. The implications of the phrase "full economic development" to geothermal development is not clear and needs definition. Geothermal resource development, by its very nature, involves the combination of various resources which seek maximum net benefits by efficient economic coordination of those resources. It would seem that geothermal development, particularly multicomponent utilization, would be a justifiable interpretation of "full economic development."

The Idaho Groundwater Act requires "the maintenance of reasonable groundwater pumping levels". The maintenance of reasonable pumping levels is of concern to geothermal development. The Director of Water Resources can establish groundwater pumping levels in areas "having a common groundwater supply". The interpretation of the phrase "common groundwater supply" is not clearly understood and subject to judicial review. Deep thermal aquifers could not be termed a "common groundwater supply", but they may be hydrologically inter-related to shallower common groundwater supplies. Excessive withdrawal of thermal waters from these deep sources could be restricted if pumping levels of other prior appropriators were affected. Thermal aquifers which are shared by geothermal

developments and other water users, such as irrigation, would fall under the broad term "common groundwater supply". This is particularly true in the Bruneau-Grandview area of northern Owyhee County where irrigation wells yield thermal waters. In all such cases, it would be prudent for the geothermal well operator to have a water right to protect himself against third party interference.

3.6.2 Attorney General Opinion

In April, 1979, the Attorney General's Office issued Opinion 79-11 as per request of the Honorable Reed Budge, President ProTem, Idaho State Senate. An Attorney General's opinion was requested to clarify Idaho's geothermal statutes. The basic conclusions of this Opinion are:

- 1) The State of Idaho claims ownership of geothermal resources whenever mineral rights are reserved by the State;
- 2) Idaho law declares that all groundwaters are owned by the State subject to appropriation under the doctrine "first in time, first in right," as governed by Title 42, Idaho Code. The law distinguishes between groundwater and energy extracted from geothermal sources which "will not unreasonably decrease groundwaters available for prior water rights..."
- 3) The State claims ownership of mineral rights and geothermal resources only in lands presently or previously owned by the State. The Geothermal Resources Act empowers the State to regulate and require permits for geothermal development upon all lands within the State.

3.6.3 Geothermal District Heating Laws

In March, 1979, the Idaho Legislature passed an act relating to municipal water systems; amending sections 50-323, Idaho Code, to include a definition of domestic uses or purposes.

Section 1 of Senate Bill No. 1062 amended these sections of the Idaho Code which empowers cities to establish and maintain domestic water systems. The term "domestic water system" and "domestic water" was amended to include, by way of example but not by way of limitation, "a public water system providing

water at any temperature for space heating or cooling, culinary, sanitary, recreational or therapeutic uses."

Section 2 of the Act amended those sections of the Idaho Code which authorize incorporated cities to issue coupon bonds for the establishment and maintenance of water systems. The Act amended the definition of "water works plant" and "water supply" to include "a public water system providing water at any temperature for space heating or cooling, culinary, sanitary, recreational or therapeutic uses."

Section 3 of the Act amended the definition of "domestic use or purposes" to include "the use of thermal water at any temperatures for space heating or cooling."

Prior to the passage of this act, it was questionable if cities could create and maintain district heating systems. Senate Bill No. 1062 establishes the necessary legal framework which empowers cities to establish, create and maintain geothermal district heating system and to finance those systems with revenue bonds.

3.6.4 Detailed State Institutional Analysis

A detailed institutional analysis is currently being documented. Figure 3.6.4 is a flow diagram of geothermal development on state lands. Specific time factors regarding each step in the flow chart are currently being studied. Table 3.6.4.1 details the major institutional requirements which have been plotted in Figure 3.6.4. Time factors are included when known.

TABLE 3.6.4.1
Geothermal Development on State of Idaho Lands

LEASING:

- 1.1 Department of Lands, upon approval of the State Board of Land Commissioners, opens state lands for geothermal leasing. Department of Lands gives public notice of open and simultaneous filing for geothermal leases.
- 1.2 Noncompetitive Lease Applications Open Filing are processed on a first-come first-served basis. Filing date is the day the lease application is received by the Department. Fee is \$25.
- 1.3 Simultaneous Filing occurs in all cases where lands become available for leasing because they are newly acquired, or because an existing lease is cancelled, relinquished, surrendered or terminated. Lease Applications so classified are awarded to qualified applicants by public drawing. Fee is \$25.

Geothermal Development Chart For State Of Idaho Lands

BLC - Idaho State Board of Land Commissioners
 DL - Idaho Department of Lands
 DWR - Idaho Department of Water Resources
 DHW - Idaho Department of Health and Welfare
 PUC - Idaho Public Utilities Commission

FIGURE 3.6.4-1

IDAHO STATE INSTITUTIONAL ANALYSIS

FIGURE 3.6.4-2
IDAHO STATE INSTITUTIONAL ANALYSIS

FIGURE 3.6.4-3
IDAHO STATE INSTITUTIONAL ANALYSIS

TABLE 3.6.4.1 (Continued)

- 1.4 Department of Lands consults with the Department of Water Resources prior to designating State lands as being within a KGRA. Actual production in the vicinity of State lands shall be the primary evidence of a KGRA. (has not happened)
 - 1.41 Department of Lands may hold a public hearing before determining the State lands are within a KGRA. This is optional and at the discretion of the Director.
 - 1.42 The Director of the Department of Lands declares State lands to be within a KGRA and post a notice of a public auction. (has not happened)
 - 1.43 Geothermal resources leases issued upon lands so designated (KGRA) shall be upon competitive bid basis and are sold at a public auction. (has not happened)
- 1.5 Lease is approved by the Department of Lands and the State Board of Land Commissioners and sent to the lessee for his signature. (Currently requires 4 to 6 months)
- 1.6 Lessee signs lease and returns it to the Department of Lands which signs the lease. Lessee shall furnish a \$2,000 bond. In lieu of the aforementioned bond, lessee may furnish a statewide bond of \$50,000 to cover all lessee's leases and operations. (currently requires 1 to 2 months)

EXPLORATION:

- 2.0 Lessee conducts casual exploration. Each lease includes provisions for diligent exploration. Diligent exploration means exploration operations on or related to the leased lands, including without limitation geochemical surveys, heat flow measurements, core drilling, or drilling of a test well.
- 2.1 Before entering upon leased lands for exploration operations and engaging in operations which may lead to appreciable disturbance or damage to the land surface, the lessee must file with the Director of Department of Lands a written notice of the scope of the operation.
- 2.2 Lessee must comply with all rules and regulations of the Department of Water Resources regarding water rights, geothermal resources and geotechnical data gathering. Notice of operation and permits are required.

TABLE 3.6.4.1 (Continued)

- 2.3 Prior to initiation of operations to drill a well for any purpose to one thousand (1,000) feet or deeper, lessee shall submit to the Department of Lands for approval a plan of operations.
 - 2.31 Geothermal exploration wells must be approved by the Department of Water Resources. A geothermal resource permit can be obtained for exploration and production wells. (currently take 2 to 4 weeks)
 - 2.32 Department of Water Resources review and approves geothermal resource permit. This process normally takes two to four weeks if there is no major potential for interference with other wells in the area.
- 2.4 Department of Lands reviews the plan operation and can require changes prior to approval. \$10,000 bond is required.
- 2.5 Exploration Drilling can begin after all necessary permits have been obtained from the Department of Lands and the Department of Water Resources. All leases shall be subject to the condition that the lessee will, in conducting his exploration, use all reasonable precaution to prevent waste of geothermal resources and other natural resources found or developed in the leased lands.

The primary term of a State geothermal lease is ten (10) years. If, at the expiration of the primary term, geothermal resources are not being produced or demonstrably capable of being produced the lease expires. The lessee is under no obligation to prove his lease until the end of the primary term. Normal exploration process, if pursued with diligence, should not take more than two years from the initial casual exploration through exploration drilling.

DEVELOPMENT:

- 2.6 Discovery of geothermal reservoir and well test.
- 3.0 Decision to develop the well field is based upon the corporate goals and the geophysical evidence.
- 3.1 Upon the approval of the Department of Lands the plan of operations can be amended to reflect changes in operation on the leased lands, including the installation of works, buildings, plants or structures for the purpose of production. A bond of \$10,000 may be required for each well or a bond of \$50,000 for all statewide operations can be posted.

TABLE 3.6.4.1 (Continued)

- 3.2 The lessee submits applications to the Department of Water Resources for permits to drill production wells, and injection wells.
- 3.3 The lessee applies for water rights for anticipated production rates from all wells and for all other waters needed for the operation of the cooling tower and plant. (currently requires 2 months up to 1.5 years)
 - 3.21 The Department of Water Resources approves Injection Permits after receiving approval from the Department of Health and Welfare. (currently requires 1 to 2 months)
 - 3.22 The Department of Water Resources approves all production well drilling permits and requires bonds and construction standards for casing and blow-out prevention. (currently requires 1 to 2 months)
- 3.4 Lessee begins development drilling operation.
 - 3.41 Injection wells are drilled after the production wells prove adequate flow rates.
- 3.5 Well tests are conducted over extended periods of time after injection wells are completed. (not always necessary)
- 3.6 Adequate production indicates that the field is capable of supplying an end use facility.

3.7 Public Outreach Programs

3.7.1 Legislative Outreach

The 1979 Idaho Legislature was presented with several bills that would influence geothermal resource development in Idaho. A legislative outreach program was initiated early in the session to provide general information about geothermal resources and specific information about the pending bills.

The legislative outreach program consisted of two types of information assistance: 1) providing data and information to individual legislators upon request, and 2) providing information briefings and testimony to selected committees. The most important aspect of this program was to provide a broad based information briefing to the Senate Energy and Environment Committee and the House Resources and Conservation Committee. A group of industrial, university and local government representatives were asked to present information regarding geothermal development projects which concern them. The following individuals gave presentations:

David McClain, Idaho Office of Energy
Bob Rolf, ORE-IDA Foods, Inc.
Jim Turner, Idaho Power Company, representing the Geothermal
Power Development Group
Roger Bissel, CH2M-Hill Engineering
Kent Maylor, Madison County Energy Commission
Jack Ramsthaller, E.G. & G., Idaho, INc.

Information briefings to the committees were conducted early in the legislative session before specific bills were considered by the committees. The timing of early briefings to legislative committees is critical. As the legislative calendar progresses, there is very little time available for the committees to consider informal briefings. Early information sessions were aimed at educating the legislators about the resource potential, current uses and potential uses.

As bills came before the committees later on in the session, testimony was taken on the need for the legislation in order to facilitate uses of geothermal resources which were described in the informal information briefings.

Four major bills which concerned geothermal resources were considered by the 45th Session of the Idaho Legislature.

Senate Bill 1062 - Space heating as a domestic use of water: This measure would allow cities to acquire and operate district heating systems using geothermal or waste heat resources and finance them via revenue bonds. The measure clarified existing law by defining "domestic water systems" to include space heating and cooling. Cities could then acquire and operate "hot" space heating water systems just as they currently acquire "cold" potable water systems.

This measure was introduced in the Senate, received a unanimous "do pass" recommendation from the Senate Resources and Environment Committee and passed the Senate on a 34-0 vote.

The measure received a unanimous "do pass" recommendation from the House Resources and Conservation Committee and passed the House without a negative vote. The measure was signed into law by Governor Evans on April 3, 1979.

This measure provides the authority for cities to revenue bond the construction of geothermal space heating systems. The measure was introduced by the Idaho Office of Energy. The passage of this bill was a direct result of the outreach program.

Senate Bill 1237 - Appropriation From the Permanent Building Fund: This measure appropriated from the Public Building Account to the Permanent Building Fund Advisory Council and the Division of Public Works the sum of \$194,400 for the purpose of retrofitting the State Capital Mall to geothermal heating. The measure received early support of the Idaho Office of Energy. A Pacific Northwest Regional Commission grant to the Office has resulted in a demonstration of geothermal heating at the State Health Laboratory. The success of this project and the timeliness of the Boise City Geothermal Project contributed to the successful passage of this bill.

The measure was passed out of the Finance Committee with a recommendation for "do pass". The measure passed the Senate 35-0-0. The bill was introduced into the House and after the second reading the rules were suspended and the bill passed 60-10-0. Bill was signed into law by the Governor on 4/3/79.

House Bill 142 - This measure, proposed by Rep. Mel Hammond, received the support of the Office early in its planning. The proposal would have allowed counties to acquire and operate energy systems. When combined with the constitutional amendment proposed in HJR-2, this measure would have helped Madison County to complete and finance the geothermal system they are investigating, with the help of a Federal grant. The measure was introduced in the House and referred to the Local Government Committee. The measure met considerable opposition and was reported out to General Orders to amend it to include only geothermal energy. This made it more acceptable and it passed the House on a 68 to 1 vote.

The measure went to the Senate side, was referred out of the Resources and Environment Committee with a "do pass" recommendation and passed the Senate with a 35 to 0 vote.

This measure allows counties to acquire and operate geothermal heating systems; however, unless the Constitution is changed, it will not be of much use. Counties may not go into debt for such systems, therefore, they have no way of financing them.

HJR-2 - Revenue Bonding for Municipal Energy Systems. This proposal was a joint resolution amending the State Constitution to allow cities and other local units of government to acquire and operate energy systems and finance them by issuing revenue bonds. The measure would have allowed the development of all energy systems, geothermal, lowhead hydro, solar, electrical, gas, etc. The measure was introduced in the House and referred to Representative Kraus's subcommittee. After hearing comments from the Office, the Co-ops and Utah Power, the subcommittee referred it back to the major committee, recommending that additional testimony be heard by the major committee. The major committee heard considerable testimony, including support from many cities, and criticism from all of the state's major

electrical utilities, and referred it back to the subcommittee for changes. The principal concerns expressed by the utilities were:

1. fear of customer pirating
2. fear of "territory" erosion
3. lack of P.U.C. jurisdiction on the siting of municipal facilities

Some changes were suggested to the concerned parties, but no consensus could be reached and the measure was never considered again.

3.7.2 Summary Listing of Contracts and Results, Outreach Programs

<u>CONTACT</u>	<u>PROSPECTIVE APPLICATION</u>	<u>COMMENTS</u>
Industry:		
FMC, Inc. Pocatello, ID	Phosphate ore processing for elemental phosphorus	No prospective applications could be found for direct use in the plant. FMC did express an interest in new electrical generation possibilities.
J.R. Simplot Fertilizer Plant Pocatello, ID	Phosphate ore processing for fertilizer	No prospective applications could be found for direct use in the plant. Simplot did express interest in potential ore drying using geothermal energy at the Conda Mine.
Geothermal Power Development Group	Electrical power generation by utilities	Asked the Office and the Governor for assistance in coordinating with DOE and BPA.
National Drilling Co. Casper, Wyoming	Equipment supply	Requested information regarding geothermal leasing and drilling activities in Idaho.
ASTM Philadelphia, Penn.	Establishing standards for equipment in geothermal applications	Asked the State to participate and provide a list of persons knowledgeable in the field.

<u>CONTACT</u>	<u>PROSPECTIVE APPLICATION</u>	<u>COMMENTS</u>
Agribusiness:		
Howard Schrag Associates Boise, ID	Fish farming	Seeking site for locating a catfish farm.
Harold Biggs Marsing, ID	Grain drying	Requested information and assistance regarding a geothermal grain dryer.
Thomas Jacobson Hailey, ID	Greenhouses	Seeking a commercial greenhouse site in the Ketchum-Hailey area.
Idaho Migrant Council Boise, ID	Greenhouses	Seeking sites throughout the State to build geothermal greenhouses
Idaho-Oregon Agriculture Trade Show Boise, ID	Food processing	A display booth on geothermal applications in agri-industry was provided to the trade show. Governor Evans was supplied information on geothermal food processing and its potential in Idaho for the keynote speech.

<u>CONTACT</u>	<u>PROSPECTIVE APPLICATION</u>	<u>COMMENTS</u>
Individuals:		
Lee Barion Fairfield, ID	Agriculture	Requested assistance on private leasing and geothermal applications for controlled environment breeding.
Greg Graham Weiser, ID	Livestock	Is considering building a geothermally heated swine parlor at Crane Creek Hot Springs adjacent to Crane Creek KGRA.
Ray Depeu Wendell, ID	Space heating	Requested information on geothermal heat for a private home.
Fred Blackburn Boise, ID	Space heating	Requested information on geothermal heat for a private home.
William Boyer Boise, ID	General	General information request.
Tim Korsmo Moscow, ID	General	General information request.
Don White University of Arizona	Legal - Institutional	Requested copies of all <u>Idaho Code</u> and related regulations concerning geothermal resources.
Anthony Apostolides Washington, D.C.	Legal - Institutional	Requested copies of all <u>Idaho Code</u> and related regulations and a list of known uses in Idaho for the Institute of International Law and Economic Development.
Ron Wells Wallace, ID	Heat pumps for space heating	Idaho Historical Society is considering alternative heating systems for historical buildings in Wallace.
Robert Olheiser State of North Dakota	Space heating	North Dakota State Laboratories and Consumer Affairs Office requested information regarding the State of Idaho geothermal space heating demonstration project.
Greg Heim Boise, ID	General	General information request.

<u>CONTACT</u>	<u>PROSPECTIVE APPLICATION</u>	<u>COMMENTS</u>
Individuals:		
John Fleischer Boise, ID	Space heating	Investigating the possibility of forming a geothermal water district in northeast Boise.
Ray Daughty Boise, ID	Space heating	Developing a 60-unit subdivision and is considering geothermal heat.
Chuck Corwin Ketchum, ID	Space heating	Considering a geothermal district heating system for the city of Ketchum.
Bud Marsh Givens, ID	Space heating	Developing a subdivision at Givens Hot Springs and is considering a geothermal district heating system.
Terry Baker Lava Hot Springs	Space heating	Requested information on materials and equipment needed to geothermally heat a home.
Dean Hawks Marsing, ID	Space heating	Requested information regarding geothermal space heating for his private home.
Virg Caldwell Boise, ID	Space heating	Requested information regarding the use of water-to-air heat pumps for low temperature wells.
George Lanning Hailey, ID	Space heating	Requested information regarding assistance in developing a geothermal well for space heating.

CONTACTPROSPECTIVE APPLICATIONCOMMENTS

Consultant Firms:

R.M.D. Associates AIA
Boise, ID

Space heating

Requested data on geothermal space heating design and equipment.

Cline, Smull and Hamill
Boise, ID

Space heating

Designing the new Cascade, Idaho high school for a future geothermal heating system. Building will use a boiler until a geothermal supply becomes available.

CH2M-HILL
Boise, ID

Space heating

Requested data regarding the market potential of a district heating system for the city of Lava Hot Springs.

Integrated Energy
Systems, Inc.
Boise, ID

Agri-industrial

Requested information regarding the Weiser Hot Springs geothermal area. Company is studying the potential of this site for a geothermal-gasahol plant.

Bert Paulus Inc.
Portland, OR

Space heating

Requested information regarding the market potential for plate heat exchangers in geothermal space heating.

Leatham, AIA
Boise, ID

Space heating

Requested information regarding design criteria for geothermal space heating systems in residential buildings.

CONTACTPROSPECTIVE APPLICATIONCOMMENTS

State Government:

Idaho Department of
Water Resources

Water rights

Agency requested information on the average water requirements needed to space heat an average new home in Idaho.

Agriculture Extension
Service

Space heating

Agency requested information regarding the potential for geothermal heating in Camas County.

Idaho Department of
Administration

Space heating

Agency requested the Energy Office geothermal program participate in the Capital Mall Geothermal Task Force.

1979 Idaho
Legislature

Space heating

Senate Bill 1062, passed and signed into law. Bill allows communities to finance geothermal district heating systems with revenue bonds.

<u>CONTACT</u>	<u>PROSPECTIVE APPLICATION</u>	<u>COMMENTS</u>
Local Government and Communities:		
Boise City	Space heating	Requested aid in coordinating Boise City geothermal project with the Capital Mall retrofit.
Lava Hot Springs	Space heating	Requested aid in applying for DOE/PERDA funds.
Madison County	Space heating	Requested assistance in petitioning the Legislature for enabling legislation which would allow counties to own and operate geothermal heating systems.
Wood River Resource Council	Industrial development	Requested aid in developing the area's geothermal resources for industrial applications.
College of Southern Idaho Twin Falls, ID	Space heating	Requested assistance and advice regarding a geothermal retrofit of the campus. well currently being drilled.
Fairfield	Space heating	Local school district requested aid in determining the feasibility of space heating the high school with geothermal heat.
Malad	Space heating	Local school district is building a new high school and is requesting aid in design of the schools heating system for geothermal heat.
Wallace	Space heating	Community task force requested information regarding the use of heat pumps for space heating. Concept involves utilizing mine waste water which is 21°C.

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