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Geothermal Feasibility Study
for
Idaho State School and Hospital
Nampa, Idaho

October 1984

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IDAHO STATE SCHOOL AND HOSPITAL
Nampa, Idaho

EXECUTIVE SUMMARY

1. Apparently it is possible to obtain a geothermal source of water at about 3,000 ft. depth that should produce 500+ GPM at 160° F.
2. The present steam and condensate lines are poorly insulated which adds to the heating costs and, in addition, the condensate lines are in poor condition. If this system is retained, it will cost upwards of \$100,000 to replace these condensate lines. This cost should be considered as an off-set against the cost of the geothermal system. I have not included this in the economic analysis simply because the cost for these repairs is next to impossible to predict with any accuracy.
3. Changing over to geothermal hot water system will reduce the gas consumption by 75%. Most of the remaining gas use (steam) would be in the laundry and kitchen.
4. In preparing this study, the assumption was made that most buildings that are presently using hot water could be heated with 155° F water. It is recommended that during the ensuing year the maintenance department be instructed to change the controls on several buildings to reduce the temperature of the hot water down to 155° F to see if comfort can be maintained at the lower setting. When this is done, the buildings should be maintained on a 24 hour basis at the daytime setting, that is, no night set back. A log of results should be maintained.
5. This study includes two possible systems. We recommend that the Basic Scheme #1 be used based on the lesser construction cost, greater overall energy savings, and we feel a better system.

6. The Basic Scheme #1 would cost \$1,989,350 to construct and would save \$235,193 per year in energy costs for a simple payback of 8.45 years. See 8.0 Economic Summary, Page 24. Costs are projected on a 1985 construction year.
7. We recommend the removal of one of the three 18,000 #/Hr. boilers and the installation of a smaller 250-300 HP (8,000-10,000 #/Hr.) boiler because of the reduced requirement of steam. This would produce the needed steam at a much higher efficiency. This is included in the economic study.
8. My calculations indicate that for the basic system #1 the total geothermal water requirement would be about 900 GPM, however, we know that there would be at least an 80% diversity of usage, therefore, the maximum demand would be 720 GPM. The discharge temperature will vary considerably, however, we estimate this at about 120° F maximum.

Symbols and Abbreviations

Gate or Butterfly Valve

Check Valve

Automatic Valve

Steam Trap

Circulating Pump

Supply Piping

Return Piping

Geo

Geothermal

Ⓔ

Existing

D.W.

Dish Washer

D.H.W.

Domestic Hot Water

H.W.H.

Hot Water Heater

C.W.

Cold Water

HX

Heat Exchanger

°F

Degrees Fahrenheit

GPM

Gallons per Minute

GPH

Gallons per Hour

BTU

British Thermal Units

BTUH

British Thermal Units per Hour

MBH

Thousand British Thermal Units per Hour

Hr.

Hour

Sq.Ft.

Square Feet

#/Hr.

Pounds per Hour

Mo.

Month

PSI

Pounds per Square Inch

PSIG

Pounds per Square Inch Gauge

KW	Kilowatts
KWH	Kilowatt Hours
Therms	100,000 British Thermal Units
Sht.	Sheet
OH&P	Overhead and Profit
Engr.	Engineer

IDAHO STATE SCHOOL AND HOSPITAL
NAMPA, IDAHO

1.0 GENERAL

1.1 The purpose of this investigation and study was to determine the feasibility of converting this facility to geothermal energy. There are 17 major buildings that are presently heated off the central boiler plant that will be considered for this conversion.

1.2 Site Visit

The first step in this study was to visit the site to inventory the buildings and gather data and information to facilitate this study. This visit was made on August 21 and 22, 1984.

1.3 Drawings

Drawings of existing buildings were very limited and for all practical purposes were non-existent for buildings prior to 1965.

1.4 Building Heat Losses

Two methods of establishing the heat load on this system were used. First, a preliminary heat load calculation was run on a typical building to establish a BTU/HR/SQ. FT. basis. This was then applied to all buildings with adjustments made based on our engineering experience. A second method was used to verify this by working backwards from the steam load on the boilers.

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2.0 EXISTING FACILITIES

2.1 Site

This facility is located just north of HWY US 84 on the extension of 11th Avenue north in Nampa, Idaho at an elevation of 2550 ft. plus and minus approximately 20 feet, sloping slightly from north to southeast. Soil conditions consist of one to 5 feet of loam over a layer of lava rock. The site is generally well landscaped with numerous large deciduous trees and large expanses of lawn. (See Figure 2.1.1).

Nampa is a city with a population of 25,112 (1980 census) located 19 miles west of Boise. Average rainfall is 10.77 inches annually and average maximum temperature of 62.9° F. and average minimum temperature of 36.8° F. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) lists winter design condition of 10° F., summer conditions of 91° F. dry bulb, 64° F. wet bulb and 5809 heating degree days per year.

2.2 Buildings

Most all major buildings within this facility are masonry construction, most with brick veneer facing. All glazing is single pane glass and with only a minimal amount of insulation. Most major buildings are three story. In addition to the major buildings there are 10 cottages used for residence housing and several maintenance type buildings. Areas of buildings as provided by the administration can be summarized as follows: (See appendix).

Total area of buildings:	382,400 sq. ft.
Area heated	338,969 sq. ft.
Area heated by boiler plant	314,216 sq. ft.
Area heated by electric	17,586 sq. ft.
Area heated by natural gas	5,314 sq. ft.
Area heated by oil	1,853 sq. ft.

FIGURE 2.1.1

2.3 Building Heating Systems

As can be seen from the above, the major heating source for this complex is provided by a gas fired steam heating plant located at the extreme north edge of the property. Three 18,000#/Hr. steam boilers operated at 120 psig pressure are available, however, only one boiler is used during the summer months to provide steam at 120 PSIG to the laundry and central kitchen and 50 PSIG steam is provided for heating domestic hot water. For heating of the buildings the steam is reduced to 50 PSIG at the boiler plant and distributed through two main lines then reduced to 7 PSIG at each building. Three steam lines are routed underground and insulated with Gilsulate insulation. This insulation is apparently in poor condition since during the winter months the snow over top of these lines melts almost as fast as it falls, this, as reported by the maintenance staff.

Apparently the condensate lines underground are in poor condition, over the past few years some sections have been replaced to repair the major leaks. None of these failed pieces of pipe were available for inspection, however it was reported that failure was from internal pitting and exterior corrosion. Approximately 7000 gallons of make-up water is added to the system each day. The majority of this is used directly through injection in the laundry. Assuming 1/3 is lost through leaks this would represent approximately \$5,000 per year. Probably an equal amount or more is lost due to underground pipe loss.

Most all buildings have mechanical rooms in the basement and have adequate room for heat exchangers, pumps, etc. About 1/3 of the heated areas are heated with hot water and the remainder are direct use steam. Those that are using hot water for heat distribution can be readily converted to use geothermal hot water although due to the lower temperature water, it will be necessary to supplement some of the radiation. Those buildings presently on steam will require extensive repiping and new radiation.

Automatic temperature controls are on an individual building basis, mostly pneumatic. The older buildings are limited to minimal thermostatic control, however the newer buildings, such as the medical building and building 1R are very adequately controlled and would require very little rework.

The ten cottages are heated with electric resistance heat. To convert these over to geothermal hot water would require complete reconstruction of the heating system to either a warm air ducted system or a baseboard hot water system in addition to the underground piping system. From experience, we know that this would not be economical at the present power rates to make this conversion feasible. At some future date, if the power rates were increased substantially, they could always be added. For this study, these cottages will not be considered.

Domestic hot water is generated on an individual building basis with the steam coils in the storage tanks. These can be converted to geothermal quite easily with the addition of heat exchangers and small in-line pumps for circulation.

2.4 Utilities

Domestic water is supplied to this facility from on-site wells through an elevated storage tank, and is nominally 57 to 58° F.

Electric power is provided by Idaho Power Company at 120/208V, three phase and purchased at primary rates.

Natural gas is provided by Intermountain Gas Company and that used in the boilers is on an interruptable rate schedule.

In 1983 the average cost of electricity was \$.02894 per kwh, and was up 2% in fiscal year 1984 for a cost of \$.0295/kwh. Gas averaged \$.5941 per therm in 1983 and was \$.4501 for the first 10 months of fiscal year 1984. (See appendix).

2.5 Geothermal Resource

Hot geothermal water in the Boise, Idaho area has been a source of energy to this area since the early 1900's. Approximately 200 homes in the eastern portion of Boise are presently heated by a district heating system, known as Boise Warm Springs Water District¹. More recently, 1981, the Capital Mall Complex in Boise (800,000 sq. ft. of buildings) has been retrofitted to be heated from the geothermal waters. In 1980 a 2150 ft. exploratory well was drilled that produced 400 gpm of 160° F. water under artesian pressure. In 1981 a second well was drilled to 3000 ft. providing nearly 1000 gpm at 162° F., also artesian². Boise is located 20 miles east of Nampa.

Located 20 miles southwest of Nampa is the Givens Hot Springs where natural hot water is used for pools and steam baths. A Preliminary Inventory of Potential Geothermal Resources as published by Eliot Allen in August 1980 shows 5 wells in the Nampa area with temperatures in the range of 66 to 88° F., however no depth is shown for these wells. Locations of these wells are noted on Figure 2.6.1.

Finally, Ms. Leah Street of the Idaho Department of Water Resources through her knowledge and experience, has predicted that a well of approximately 3000 feet should produce at least 500 gpm at 160° F. For purposes of this study, we will use this data as basis for this study.

¹ Design of a Geothermal District Heating System for Boise, Idaho; by Little, Austin and Bissale, 1981

² Idaho Capitalizes on its Geothermal Resources; by Austin, Fettkether and Chase, 1984

Figure 2.6.1

3.0 DISCUSSION OF ALTERNATE SYSTEMS

3.1 Basic System #1

There are at least two types of systems that can be used for this facility. The basic system will be considered wherein the geothermal water will be circulated to each building and heat exchangers will be located at each building to convert the geothermal energy to a closed loop hot water system within the building and also used to heat domestic hot water as applicable. Two of the buildings use steam for processing purposes namely the laundry and kitchen, therefore, it will be necessary to maintain the steam system to these buildings. Since the demand for steam will be very limited, it is recommended that a small high pressure steam boiler be installed to replace one of the existing boilers in order to improve the efficiency. With the 160° F, it will probably be necessary to boost the water temperature to 180° during severe weather in order to maintain the heating in the buildings other than the laundry and kitchen. However, even under this condition the geothermal water would still provide better than 75% of the heat energy for the entire facility. See Drawing #M-8 for schematic of head-end piping, also see Drawing #M-1 for suggested layout of underground piping.

The following discussion for each building is based on this type system:

3.2 Medical Building

This facility is a modern 95-bed hospital and clinical treatment center and is presently heated for the most part with hot water generated from the existing steam system, as is the domestic hot water. The equipment in the basement of this building is tightly placed, however, there is room for added heat exchangers. We propose cascading the geothermal water through two heat exchangers, one for heating and one for domestic hot water.

The estimated heat load is 3.04×10^6 BTUH or 300 GPM of geothermal water, the domestic hot water load is 1.743×10^6 BTUH and will reuse the discharge geothermal water from the heating heat exchanger, see Drawing #M-2. Steam is also used in this building for sterilizers. It would, therefore, be necessary to add a small electric boiler to provide steam for this use.

3.3 White Hall

This building is divided into three major uses, administration, dietary, and supply. The administration area has been converted to hot water heating, dietary is heated mainly with cast iron radiation. The make-up air to the kitchen, although originally heated with steam, has been disconnected and presently uses untreated outside air. The storage areas are heated with steam unit heaters.

The administration area can be heated with geothermal with the addition of a water-to-water plate heat exchanger. The other areas may be served off the same heat exchanger and reuse the existing steam pipe for supply, however, the condensate pipe will have to be replaced.

Domestic hot water can be generated in a separate heat exchanger and reuse the existing shell-and-tube steam heat exchanger to boost the temperature for the dish washer and other equipment requiring 180° F water.

Our estimate of geothermal requirement for this building is 1923 MBH or 96.2 GPM @ 40° F temperature change for heating and 1070 MBH or 36.0 GPM @ 40° F temperature change for domestic hot water. See Drawing #M-3.

3.4 Laundry Building

This building of 7,168 sq. ft. uses very little heat for heating the building due to the radiated heat off the laundry equipment. Since it is necessary to have steam into the building for the dryers and since the heating units and piping within the building are in good condition, it would not be economically feasible to convert the heating to geothermal hot water.

The geothermal hot water can be used for 75% of the heating of the domestic hot water which is the major use of energy in this building. This would be done by installing a water-to-water plate type heat exchanger and circulating system and leaving the existing tank heater to boost the temperature from 150° F to 180° F.

The geothermal energy required would be 1,161,000 BTUH or 39 GPM for heating the domestic hot water to 140° F. See Drawing #M-4.

3.5 Therapy Pool

This is the newest addition to this facility. The pool and building are heated with steam and the domestic hot water is heated with electric.

The pool heater is designed to raise 75 GPM of pool water from 80° F to 100° F and the building is heated with three 25,000 BTUH unit heaters. The domestic electric water heater is a 36 KW unit which equals 122,760 BTUH. The future intent is to enclose the pool area, when this is done, additional heat will be required to heat the make-up air which will be required for condensation control.

To convert this building to geothermal will require three separate heat exchangers. This will require a total of 1,183 MBH and a flow of 36.5 GPM. See Drawing #M-5.

3.6 Ramsey School

This facility incorporates classrooms, gymnasium, and dressing rooms and at present is heated with steam to convectors and unit ventilators in the 1957 addition, the older portion is similar with radiation in classrooms. The heat loss for the 1957 addition was estimated from the drawings and installed radiation and includes heating of outside air through the unit ventilators.

Total heating requirement for this building is 1,636,000 BTUH and 260,000 BTUH for heating domestic hot water. The geothermal water required for both functions will be 118 GPM.

Extensive repiping will be required since this building is a steam system. The steam pipes may be reused for supply but the condensate is inadequate for return piping. Piping and heat exchangers in the mechanical room will be similar to Drawing #M-6.

3.7 Staff House and Building #6

Both of these buildings were built in 1950 and remodeled to include hot water heating in 1976. Both buildings are residence facilities. Therefore, they will be treated similarly with heat exchangers in each building, one each for heating and domestic hot water.

Estimated heat loss for the staff building is 812,000 BTUH and for Building #6 is 600,000 BTUH, domestic hot water is 142,000 BTUH and 116,000 BTUH, respectively. This can be performed with two heat exchangers in each building, one for heating and one domestic hot water similar to Drawing #M-6. The geothermal water required is 58 GPM for the staff house and 43.3 GPM for the Building #6.

3.8 Building 1R - Residence Hall

This is one of the newer buildings, it has considerable glass and brick exterior and is not well insulated by today's standards. Heating is recirculated hot water generated with steam as is the domestic hot water. The mechanical room in the partial basement is exceedingly clean and spacious. We propose separate plate-type heat exchangers for each domestic hot water and heating.

The estimated heat loss for the building is 832,000 BTUH and the domestic hot water load is 209,160 BTUH. The two loads together will require 76 GPM of geothermal water. See Drawing #M-6.

3.9 Buildings #4 and #9

These two buildings are similar in usage and both have steam heat. Extensive remodeling of the heating piping will be required and some radiation will have to be supplemented. The domestic hot water requirements are similar in each building and will require a heat

exchanger for 125,500 BTUH. Building heating requirements are 480,000 in Building #4 and 727,500 in Building #9, which will require a maximum of 50.8 (this includes Building #2) and 52 GPM of geothermal water respectively. Similar to Drawing #M-7.

3.10 Building #2

Building #2 is used for staff development and is heated directly with steam. The domestic hot water usage is very minimal and it would be most economical to use a small electric hot water heater for this purpose. Complete replacement of the heating system is recommended. The heat loss is estimated at 228,000 and will be provided with hot water from the heat exchanger in Building #4. See Drawing #M-7.

3.11 Building #7 and #5

Building #7 is one of the older buildings, the lower floor is used by the ground maintenance crew, the first floor is used for employee training and the top floor for storage. There is very little demand for domestic hot water, therefore, economics would dictate the use of a 50 gallon electric HWT in the basement to provide the hot water. The heating is converted to hot water. The existing steam domestic hot water tank does not appear to be in very good condition.

Building #5, which is adjacent to Building #7 has been converted to a hot water system with fan coil units and is used as a residence building.

The heating for these two buildings could be provided from one heat exchanger in the basement of Building #5 and the hot water piped to Building #7. The domestic hot water tank in Building #5 does not appear to be in good condition and it is recommended that this be replaced.

The heating requirement of these two buildings is estimated at 900,000 BTUH and the heating of the domestic hot water for Building #5 requires 142,000 BTUH, 60 GPM of geothermal water will do this heating with separate heat exchangers for the heating and the domestic hot water. See Drawing #M-7.

3.12 Alternate System #2

In this system, we would install heat exchangers in the boiler room and circulate the secondary closed-loop system to each building where it would be directly connected to the building heating system. There would still be heat exchangers in each building to heat the domestic hot water and in the case of the therapy pool, a heat exchanger would be required to heat the pool. These secondary heat exchangers would now use the secondary closed-loop water system as the heating medium in place of the geothermal water. Also, as is the case with the basic system, it would be necessary to have a steam-to-hot water heat exchanger in the boiler room to boost the temperature of the closed-loop system in severe weather. This system will be compared with the basic system to determine the most economical system. See Drawing #M-9 for schematic of head-end piping and #M-10 for suggested layout of underground piping.

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4.0 MATERIALS

- 4.1 Materials and equipment for this project were based on past experience with geothermal systems. In talking with the maintenance personnel, it was evident that the present condensate system was in poor condition and that a good share of the pipes that have failed and been replaced showed corrosion from the outside as well as some pitting on the interior of the piping. From this, we know that the ground conditions are aggressive and have, therefore, based all underground piping on the use of pre-insulated reinforced fiberglass pipe (RFP).
- 4.2 All valves, pumps, and heat exchangers in contact with the geothermal water were based on ferrous metals. It has been proven that the copper alloys will deteriorate very rapidly when in contact with the geothermal waters.
- 4.3 We have not projected a computerized control system for this project due to the cost, although all systems have been estimated on the basis that they would operate completely automatic with nothing more than routine preventative maintenance. Present maintenance procedures are such that each building is checked at least once a week and we do not see where this system would require any additional maintenance.

A computerized control and monitoring system which could relay operational characteristics and stop-start functions at each building back to a central control point could be added in the future. We feel this is beyond the scope of this study, however, if there was any interest in this type system then there should at least be an empty plastic conduit installed in the trenches during the pipe installation to link all buildings back to a central control point. The cost would be very minimal.

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5.0 COST ESTIMATES

5.1 Cost estimates were prepared for both the Basic System #1 and the Alternate System #2. These costs were arrived at from three separate sources. First we obtained manufacturer's quotes for the cost of the piping and heat exchangers; other valves, piping, labor, costs per square foot, and etc. were estimated using the 1984 edition of "Means Mechanical Cost Data"; and, finally some costs were used, verified, and tempered from previous projects and from our own experiences. Detailed estimate sheets are attached in the appendix.

Results of these estimates and cost savings are summarized in Table #1.

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6.0 OPERATION AND MAINTENANCE

6.1 Buildings

All systems within the buildings with this geothermal system would be completely automatic and would require slightly less maintenance than the existing steam system, however, over the projected life of the system, the difference would be negligible.

6.2 Boiler Room

Presently, the Boiler Room is manned on a 24-hour basis, two men on day shift and one each on the two night shifts. These people are paid \$6.55 per hour, adding taxes and fringe benefits this cost to the State would probably be at least \$8.18 per hour.

With the addition of a smaller, completely automatic steam boiler as recommended elsewhere in this report and with the conversion over to the geothermal system, we would not see the need for any more than one man on the day shift, to be conservative we will assume two men. This would represent a savings of approximately \$46,000 per year. These two men would still have time to maintain the boiler room appearance in the excellent manner that it is at present, maintain the pumps, boiler, equipment, and record operation.

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7.0 ENERGY SAVINGS

7.1 Basic Scheme #1

The geothermal system would do all the heating in the buildings except for perhaps 5% of the hours during severe weather when some peaking load may be added from the boilers. Most all the heating of the domestic hot water would also be provided by the geothermal, the exception to this would be at the laundry, kitchen, and two small electric hot water tanks.

Therefore, to determine the savings, we have estimated the steam load that would remain and the difference between the present usage and this remaining steam load would be the gas savings. This was estimated as follows:

Steam used in Laundry

Washer, Dryers, Mangle	806,900 #/Mo
Boost D.H.W.	73,000

Steam used in Kitchen

Cooking Equipment	200,000
Boost D.H.W. for Dish Washer	<u>12,000</u>

1,191,900 #/Mo

With boiler efficiency of 80%, the yearly usage equals:

$$\frac{1,192,000 \times 12 \text{ Mo.}}{80\%} = 17.880 \times 10^6 \text{ #/Year}$$

Cost of steam based on 1983-84 cost of \$.4501/Therm:

$$\frac{17.880 \times 10^6 \times 1,000 \text{ BTU/\#} \times \$.4501/\text{Therm}}{100,000 \text{ BTU/Therm}} = \$80,477.00/\text{Year}$$

Assume pipe loss and make-up at 10% = \$ 8,048.00

Peaking steam load, 10,000 Therms/Year = 4,500.00

Total Steam Cost = \$93,035.00/Year

Using the average cost of gas for the last two years of \$287,378, then the annual savings of gas equals \$287,378 - \$93,035 = \$194,343.00

Offsetting costs would be the increase in electrical costs as follows:

Well pump run 365 days per year at average 1/2 loads:

50 BHP x .746 x 1/2 x 24 Hrs. x 365 Days x \$.03 = \$4,900.00

2 Electric Hot Water Tanks added = 400.00

1 - 10 KW Elec. Boiler in Medical Bldg. = 440.00

1 - 36 KW D.H.W. - Therapy Deleted = - 590.00

Extra Cost of Elec. = \$5,150.00

Total Savings = Gas Savings - Electric Costs

= \$194,343 - \$5,150 = \$189,193.00

7.2 Alternate Scheme #2

The savings in gas would be the same as for

Scheme #1 \$ 194,343.00

Well Pump 75 x .746 x 1/2 x 24 x 365 x .03 = \$ 7,352.00

2 - Electric H.W.H. 400.00

1 - 10 KW Boiler - Medical Bldg. 440.00

1 - 36 KW D.H.W. - Therapy Deleted - 590.00

2 - 10 HP Circulating Pumps 3,920.00

\$ 11,522.00

Gas Savings - Electric Costs = Savings:

$$\$194,343 - 11,522 = \underline{\$182,821.00}$$

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8.0 ECONOMIC SUMMARY

	Basic <u>Scheme #1</u>	Alternate <u>Scheme #2</u>
Site Work, Well and Head-End	\$ 586,900.00	\$ 601,756.00
Site Work Piping	240,935.00	318,804.00
Building Conversion	570,805.00	570,805.00
Adjustment to Bldg. Conv. (Sht. #9)	-	- 38,343.00
Provide New Boiler (Sht. #10)	74,000.00	74,000.00
Replace Steam & Cond. to Laundry & Kit.	22,000.00	22,000.00
Subtotal	\$1,494,640.00	\$1,549,022.00
Add 10% Contingency	149,460.00	154,902.00
Subtotal	\$1,644,100.00	\$1,703,924.00
Add 10% OH&P	164,400.00	170,392.00
Subtotal	\$1,808,500.00	\$1,874,316.00
Add 10% Engineering	180,850.00	187,431.00
TOTAL COST	\$1,989,350.00	\$2,061,747.00
Savings:		
Gas Savings	\$ 194,343.00	\$ 194,343.00
Added Elec. Cost	- 5,150.00	- 11,522.00
Maintenance Savings	<u>46,000.00</u>	<u>46,000.00</u>
TOTAL SAVINGS	\$ 235,193.00	\$ 228,821.00
Simple Payback - years	8.46	9.01

APPENDIX

GROSS SQUARE FEET OF ISSH BUILDINGS

<u>Building Number</u>	<u>Building Name</u>	<u>Type of Heat</u>	<u>Square Feet</u>	<u>Date Const.</u>
3001 - 14066	Medical Building	Hot Water	A 884	1964
			1A 9,280	
	Total Square Feet Heated		1B 13,104	
	60,816		1C 11,856	
			1D 10,400	
			1E 10,400	1919
		Cen. Supp.	5,776	
		TOTAL	61,700	
3002 - 14075	White Hall	Hot Water	A 520	1918-1965
			B 6,534	
	Total Square Feet Heated		C 6,534	
	13,068	TOTAL	13,588	
	Kitchen-Canteen-Dietary	Steam	A 3,735	1926-1946
		Kitchen	B 5,264	1951-1974
	Total Square Feet Heated		B 12,906	
	25,145		C 6,829	
		TOTAL	28,734	
	Commissary	Steam	A 11,570	1955
			B 9,957	
	Total Square Feet Heated		C 9,348	
	19,305	TOTAL	30,875	
3003 - 14072	1R	Hot Water	A 528	1966
	Total Square Feet Heated		B 16,631	
	4,673 16,631	TOTAL	17,159	
3004 - 14074	Staff House	Hot Water	A 3,482	1950
			B 10,715	1976 Mech.
	Total Square Feet Heated		C 9,198	
	21,649	TOTAL	23,395	
3005 - 14073	Ramsay School	Steam Mech.	1,375	1951-1957
			A 2,376	
	Total Square Feet Heated		B 9,301	
	16,645		Gym 4,968	
		TOTAL	18,020	
3006 - 14070	Building 6	Hot Water	A 2,243	1950
			B 8,002	1976 Mech.
	Total Square Feet Heated		C 8,002	
	16,004	TOTAL	18,247	
3007 - 14097	Building 7	Hot Water Mech	540	1929
			A 3,960	
	Total Square Feet Heated		B 4,500	
	12,960		C 4,500	
		TOTAL	13,500	

3008 - 14098	Building 8	Hot Water Mech	377	1929
		A	3,200	
	Total Square Feet Heated	B	3,577	
	10,354	C	3,577	
		TOTAL	10,731	
3009 - 14071	Building 9	Steam Mech	684	1950
		A	1,964	1976 Mech
	Total Square Feet Heated	B	9,019	
	18,038	C	9,019	
		TOTAL	20,686	
3010 - 14069	Building 4	Steam Mech	462	1938
		A	4,982	1976 Mech
	Total Square Feet Heated	B	5,444	
	15,870	C	5,444	
		TOTAL	16,332	
3011 - 14099	Building 11	Steam	A 4,612	1931
			B 4,612	
	Total Square Feet Heated		C 4,612	
	9,224		TOTAL 23,060	
3012 - 14068	Building 2	Steam Mech	596	1950
		B	3,676	
	Total Square Feet Heated	C	2,025	
	5,701	TOTAL	6,297	
3013 - 14076	Laundry	Steam	A 510	1944-1956
	Total Square Feet Heated	B	7,168	
	7,168	TOTAL	7,678	
3014 - 14085	Heating Plant	Not Heated	A 4,000	1963
3015 - 14106	Building 15	Steam	A 800	
		B	1,200	
	Total Square Feet Heated	C	760	
	1,960	TOTAL	2,760	
3016 - 14077	Maintenance	Steam	B 5,800	1954
	Total Square Feet Heated	C	4,300	
	5,800	TOTAL	10,100	
3017 - 14105	Building 3	Hot Water	A 251	
		B	1,443	
	Total Square Feet Heated	C	1,971	
	3,414	TOTAL	3,665	

3018-14067	Building 5	Hot Water Mech	410	1938-1966
		A	4,890	
	Total Square Feet Heated	B	5,300	
	15,490	C	5,300	
		TOTAL	<u>15,900</u>	

3019-14079	Environmental Control Steam	A	1,450	1954
		B	720	
	Total Square Feet Heated	C	1,450	
	3,620	TOTAL	<u>3,620</u>	

3020-14084	Service Station	Gas	A	2,160	1945-1963
	Total Square Feet Heated		Paint	1,080	
	3,240			<u>3,240</u>	

3021-14078	M & W	Steam	Weld	1,500	1954
	Total Square Feet Heated		Garage	1,900	
	3,400		TOTAL	<u>3,400</u>	

3022-3021 14086-14095	Cottages 1-10	Electric	B	1,512	1970
	Total Square Feet Heated			X 10	
	15,120			<u>15,120</u>	

3032-14096	Cottage 11	Oil	B	1,853	1950
	Total Square Feet Heated				
	1,853				

3035-14114	New Dairy Barn	Gas		2,074	
	(Paint Shop)				
	Total Square Feet Heated				
	2,074				

3039	Pump House 1	Electric	B	150	1954
	Total Square Feet Heated				
	150				

3040	Pump House 3-A/C Shop	Electric	B	500	1954
	Total Square Feet Heated				
	500				

3042	Staff House Garages	No heat	B	4,200	1950
------	---------------------	---------	---	-------	------

3059-14100	Chapel	Electric	B	1,624	1974
	Total Square Feet Heated				
	1,624				

3060

Pump House 4
Total Square Feet Heated
192

Electric

B

192

1976

Total Square Feet of Buildings	382,400
Total Square Feet Heated	327,011 338,964
Total Square Feet Heated by Heat Plant	302,258 314,216
Total Square Feet Heated by Electric	17,586
Total Square Feet Heated by Natural Gas	5,314
Total Square Feet Heated by Oil	1,853

Compiled by R.W. Cooke - Business Administrator 1966

Revised by J.V. Faletti - Maintenance Director 1977

Revised by C.C. Frey 1979

UTILITY USAGE AND COST REVIEW : NATURAL GAS USAGE: ccf x 1000

	FY 1975	FY 1976	FY 1977	FY 1978	FY 1979	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	FY 1986
JULY				26,724	26,902	25,758	26,778	23,698	24,369	21,246	.556	
AUGUST				28,299	27,405	25,302	25,472	20,676	21,246	23,330		
SEPTEMBER				30,298	33,162	24,655	29,267	24,340	28,137	26,650	.536	
OCTOBER				45,039	44,976	39,588	43,192	41,163	37,551	39,094	.491	
NOVEMBER				58,875	66,920	56,916	58,171	51,391	58,482	51,474	.470	
DECEMBER				57,895	72,350	67,312	63,716	60,596	62,978	71,466		
JANUARY				65,909	85,884	69,703	60,651	68,596	65,863	77,587	.438	
FEBRUARY				50,508	63,925	57,317	54,200	63,202	51,053	65,223		
MARCH				50,678	47,578	58,118	51,411	56,790	48,751	52,583	.481	
APRIL				39,616	42,809	30,826	44,235	47,082	42,809	49,125		
MAY				42,649	32,444	32,388	34,275	34,363	39,530			
JUNE				24,579	24,402	31,291	27,277	27,395	23,298			
TOTAL				521,069	568,757	519,174	518,645	519,292	504,067	477,781		
AVERAGE				43,422	47,396	43,265	43,220	43,274	42,006	47,781		
COST/PER				.2352	.2632	.3786	.4571	.5160	.5946	.4501		
TOT. COST				122,545	149,705	196,574	237,049	267,966	299,757			
INC. (DEC)					+9%	(9%)	-	-	+12%	+8%		

UTILITY USAGE AND COST REVIEW : NATURAL GAS SERVICE: COST BY MONTH

	FY 1975	FY 1976	FY 1977	FY 1978	FY 1979	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	FY 1986
JULY	\$ 2,529	\$ 3,229	\$ 4,078	\$ 5,936	\$ 6,418	\$ 6,998	\$ 12,568	\$ 4,825	\$ 13,802	\$ 11,819		
AUGUST	2,344	3,535	4,397	6,306	6,869	6,944	12,069	9,419	12,708	12,874		
SEPTEMBER	2,641	4,492	4,680	6,712	8,028	7,046	13,951	10,991	16,185	14,277		
OCTOBER	4,099	2,429	5,713	10,874	11,823	13,621	19,118	21,612	20,779	19,211		
NOVEMBER	4,099	2,429	5,713	14,146	17,684	21,108	26,518	27,075	32,067	24,729		
DECEMBER	4,099	2,429	5,713	14,079	19,129	26,187	28,635	32,482	35,082	35,525		
JANUARY	4,099	2,429	5,713	15,307	22,718	27,053	27,583	37,037	36,581	38,635		
FEBRUARY	4,099	2,429	6,629	11,810	16,992	22,295	24,801	35,476	28,022	32,357		
MARCH	7,530	5,646	11,729	11,655	12,617	22,603	23,592	27,511	48,433	25,610		
APRIL	7,905	8,237	11,729	9,424	11,795	12,730	20,104	26,500	22,916			
MAY	5,724	5,287	9,617	10,360	8,891	15,175	15,636	19,234	20,437			
JUNE	3,413	4,862	6,077	5,936	6,741	14,814	12,474	15,804	12,745			
TOTAL	52,581	47,433	81,788	122,545	149,705	196,574	237,049	267,966	299,757	215,037		
AVERAGE	4,382	3,953	6,816	10,212	12,475	16,381	19,754	22,331	24,980			
COST/PER												
TOT. COST												
INC. (DEC)		(10%)	+72%	+50%	+22%	+31%	+21%	+8%	+12%	(-12%)		

UTILITY USAGE AND COST REVIEW : ELECTRICAL SERVICE: KWH

	FY 1975	FY 1976	FY 1977	FY 1978	FY 1979	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	FY 1986
JULY				341,280	311,760	345,600	325,200	316,800	343,200	342,000		
AUGUST				350,640	499,800	361,200	376,200	406,800	377,400	364,000		
SEPTEMBER				320,760	339,000	365,400	349,200	378,000	361,200	346,200		
OCTOBER				266,760	264,000	262,200	270,000	295,800	254,400	256,200		
NOVEMBER				253,440	260,400	262,800	288,600	263,400	275,800	270,600		
DECEMBER				294,120	166,200	297,000	316,800	313,800	300,600	301,200		
JANUARY				325,440	174,600	315,600	333,600	321,600	317,400	311,400		
FEBRUARY				328,680	241,200	312,000	315,000	357,600	320,400	337,800		
MARCH				310,680	304,200	312,000	327,600	315,600	267,000	309,600		
APRIL				288,000	297,000	298,200	290,400	297,000	273,000	311,400		
MAY				255,240	267,000	247,000	279,000	288,600	270,000			
JUNE				227,160	310,200	310,000	268,800	258,600	296,400			
TOTAL				3562,200	3435,360	3689,000	3740,400	3813,600	3656,800			
AVERAGE				296,850	286,280	307,410	311,700	317,800	304,733			
COST/PER				.01640	.01629	.01850	.02068	.02472	.02894			
TOT. COST				58,428	55,963	68,247	77,367	94,287	105,828			
INC. (DEC)					(-4%)	+7%	+1%	+2%	(-4%)	+2%		

In KWH

UTILITY USAGE AND COST REVIEW : ELECTRICAL SERVICE: COST BY MONTH

	FY 1975	FY 1976	FY 1977	FY 1978	FY 1979	FY 1980	FY 1981	(Recorded for ending date of billing) FY 1982 FY FY FY FY 1983 1984 1985 1986				
JULY	\$ 2,925	\$3,269	\$2,990	\$5,589	\$5,051	\$6,222	\$7,036	\$6,960	\$ 9,687	\$ 9,704		
AUGUST	2,962	3,465	3,329	6,411	6,883	6,511	7,993	8,066	10,599	10,434		
SEPTEMBER	2,638	3,228	4,873	6,104	4,769	6,025	7,304	7,871	10,389	10,039		
OCTOBER	2,816	1,871	3,980	4,375	4,333	4,758	6,393	6,822	7,853	7,669		
NOVEMBER	2,491	1,759	2,486	4,242	4,190	4,806	6,090	6,509	8,125	8,240		
DECEMBER	2,134	2,051	4,432	4,598	3,170	6,347	6,700	8,079	8,773	8,822		
JANUARY	2,215	2,097	4,433	5,153	3,131	5,309	6,889	8,385	9,200	9,025		
FEBRUARY	2,217	2,216	4,706	4,519	4,433	5,332	6,513	8,920	9,171	9,629		
MARCH	2,704	2,539	4,256	4,721	4,658	5,500	6,582	8,885	7,745	9,092		
APRIL	3,065	2,248	3,842	4,351	4,762	5,637	6,054	8,325	7,840	9,136		
MAY	2,948	2,121	3,943	3,984	4,734	5,438	5,728	7,993	7,824			
JUNE	2,861	2,256	5,379	4,381	5,849	6,362	4,085*	7,472	8,632			
TOTAL	31,976	29,120	48,649	58,428	55,963	68,247	77,367	94,287	105,838			
AVERAGE	2,665	2,427	4,054	4,869	4,664	5,687	6,447	7,857	8,820			
COST/PER												
TOT. COST												
INC. (DEC)		(9%)	+ 67%	+20%	(-4%)	+22%	+13%	+22%	+12%	+ 3%		

In Costs

*Includes a credit billing

JOB COST ESTIMATE FORM-NO. 155				
Name	Idaho State School and Hospital	Phone	Date	9/20/84
Street		City Nampa	State	Idaho
Location of Job				Sheet No. 1
Estimator	JKB	Estimate No.		
Description of Job	Site Work Scheme #1			

[illegible]

**BALZHISER/HUBBARD
& ASSOCIATES**
P.O. BOX 2687 • EUGENE, OR. 97402

JOB COST ESTIMATE FORM-NO. 155

Name	Idaho State School and Hospital	Phone		Date	9/20/84
Street		City	Nampa	State	Idaho
Location of Job				Sheet No.	2
Estimator	JKB	Estimate No.			
Description of Job	Site Work, Scheme #1				

NO.	DESCRIPTION MATERIALS - EMPLOYMENT	UNIT PRICE	LABOR		EXTENSIONS		TOTAL
			HOURS	RATE			
1200	- 6" RFP Insulated	17.00		5.00			26,400.00
1150	- 5" RFP Insulated, Use 6"	17.00		5.00			25,300.00
850	- 4" RFP Insulated	13.75		3.50			14,662.50
950	- 3" RFP Insulated	10.50		3.00			12,825.00
400	- 2-1/2" RFP Insulated, Use 3"	10.50		3.00			5,400.00
250	- 2" RFP Insulated	10.00		2.50			3,125.00
700	- 1-1/2" RFP Insulated, Use 2"	10.00		2.50			8,750.00
300	- 8" RFP Insulated	24.20		6.00			9,060.00
40	Fittings						12,662.70
550	- 8" RFP Non-insulated	19.50		3.50			12,650.00
850	- 6" RFP Non-insulated	12.50		3.00			13,175.00
800	- 5" RFP Non-insulated, Use 6"	12.50		3.00			12,400.00
1050	- 4" RFP Non-insulated	7.50		2.00			9,975.00
900	- 3" RFP Non-insulated	6.00		2.00			7,200.00
600	- 2-1/2" RFP Non-insulated, Use 3"	6.00		2.00			4,800.00
250	- 2" RFP Non-insulated	5.00		1.50			1,625.00
40	Fittings						6,182.50
48	Thrust Blocks						2,400.00
5500	- Trench & Backfill	5.00					27,500.00
200	cu.yd. - Sand Backfill	5.00					1,000.00
100	LF Concrete Sidewalk Remove & Repl.						1,000.00
1000	LF Black Top Remove & Repl.	3.50yd					1,200.00
14	Conn. to Build. Jack Hammer	150					2,100.00
12	Valve Boxes	200					2,400.00
	Survey & Staking						5,000.00
2	6" Valves, Butterfly	400					800.00
2	5" Valves, Butterfly	400					800.00
4	4" Valves, Butterfly	250					1,000.00
8	3" Valves, Butterfly	185					1,480.00
8	2-1/2" Valves, Butterfly	185					1,480.00
4	2" Valves, Butterfly	100					400.00
	TOTALS						234,752.70

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JOB COST ESTIMATE FORM-NO. 155

Name	Idaho State School and Hospital	Phone		Date	9/20/84
Street		City	Nampa	State	Idaho
Location of Job				Sheet No.	3
Estimator	JKB			Estimate No.	
Description of Job	Site Work - Scheme #2				

NO.	DESCRIPTION MATERIALS - EMPLOYMENT	UNIT PRICE	LABOR		EXTENSIONS		TOTAL
			HOURS	RATE			
1100	- 8" FRP Non-insulated	23.00					25,300.00
2950	- 8" FRP Insulated	30.20					89,090.00
1250	- 6" FRP Insulated	22.00					27,500.00
2400	- 4" FRP Insulated	16.75					40,200.00
2100	- 3" FRP Insulated	13.50					28,350.00
400	- 2" FRP Insulated	12.50					5,000.00
Lot	Fittings						25,850.00
5550	Excavation						
250	cu.yd. Sand Fill						
	Thrust Blocks, Excav. Valves, etc. same as Sheet #2						48,560.00
4	Circulating Pumps & 8 - 6" Valves						10,500.00
1	Production Well						300,000.00
1	Reinjection Well						200,000.00
1	Pump House						3,500.00
1	Pump 900 GPM @ 250 Ft.Hd. Installed						50,000.00
1	Controls						8,500.00
1	Hydo Tanks						5,000.00
1	Sand Trap Tank						1,200.00
2	HX-23	16,803					33,606.00
	Steam Piping & Cond.						1,200.00
1	HX-25						12,300.00
	Misc. Piping						4,500.00
	Labor in Boiler Room						7,500.00
	Insulation						4,500.00
8	8" Valves						4,000.00
2	6" Valves						800.00
2	Auto Valves						4,500.00
1	2" Valve						150.00
	Electrical						4,500.00
	Survey & Staking						5,000.00
	TOTALS						951,106.00

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JOB COST ESTIMATE FORM-NO. 155

Name	Idaho State School and Hospital	Phone		Date	9/20/84
Street		City	Nampa	State	Idaho
Location of Job				Sheet No.	4
Estimator	JKB	Estimate No.			
Description of Job	Building Conversion Costs				

NO.	DESCRIPTION MATERIALS - EMPLOYMENT	UNIT PRICE	LABOR		EXTENSIONS	TOTAL
			HOURS	RATE		
	Medical Building					
1	HX-1					4,885.00
1	HX-2					2,699.00
1	Hot Water Coil					1,200.00
1	Piping in Building, Lot					10,000.00
3	Control Valves & Controllers					3,600.00
	Insulation					5,000.00
	Labor, Set Ht. Exch					1,400.00
1	Steam Boiler, Elec or Gas, Installed					4,600.00
	Electric					1,000.00
1	Pump					600.00
	White Hall - Admin.					
1	HX-3					3,392.00
2	Control Valve & Controller					6,000.00
1	HX-4					2,137.00
1	Pump					600.00
	Piping Ht. Exch, Connect to Exist HW					5,000.00
	Insulation					3,000.00
	Kitchen-Dietary					
	New Piping & Terminal Units					
	25,145 Sq.Ft.	4.00				100,500.00
	Demolition					20,000.00
	Warehouse					
	New Piping, Unit Heaters					
	19,300 Sq.Ft.	2.00				40,000.00
	Demolition					10,000.00
	TOTALS					225,613.00

Name	Idaho State School and Hospital	Phone	Date	9/20/84
Street		City	Nampa	State
Location of Job				Idaho
Estimator	JKB		Sheet No.	5
Description of Job	Building Conversion Costs		Estimate No.	

[illegible]

JOB COST ESTIMATE FORM-NO. 155				
Name	Idaho State School and Hospital	Phone	Date	9/20/84
Street		City Nampa	State	Idaho
Location of Job			Sheet No.	6
Estimator	JKB	Estimate No.		
Description of Job				

[illegible]

Name	Idaho State School and Hospital	Phone	Date	9/20/84
Street		City	Nampa	State
Location of Job				Idaho
Estimator	JKB		Sheet No.	7
Description of Job			Estimate No.	

NO.	DESCRIPTION MATERIALS - EMPLOYMENT	UNIT PRICE	LABOR		EXTENSIONS	TOTAL
			HOURS	RATE		
	Building #4					
1	HX-17					1,959.00
1	HX-18					814.00
2	Control Valves & Controllers					1,500.00
1	Pump					500.00
1	HWT Installed					500.00
	Piping in Mech. Rm, Incl. Insul.					4,500.00
	Demolition					15,000.00
	Conversion to HW, New					
	Terminal Units, 15,870 Sq.Ft.	3.00				48,000.00
	Building #9					
1	HX-19					2,015.00
1	HX-20					819.00
2	Control Valves & Controllers					1,500.00
1	Pump					500.00
1	HWT					500.00
	Piping & Insulation					4,500.00
	Demolition					15,000.00
	Conversion, 18,000 Sq.Ft.					54,000.00
	Building #2					
1	Elec HWT					1,200.00
	Demolition					6,000.00
	Conversion to HW, 5,700 Sq.Ft.	4.00				23,000.00
	TOTALS					181,807.00

[illegible]

Name	Idaho State School and Hospital	Phone	Date	9/20/84
Street		City Nampa	State	Idaho
Location of Job				Sheet No. 9
Estimator JKB				Estimate No.
Description of Job				

[illegible]

Name	Idaho State School and Hospital	Phone	Date	9/20/84
Street		City Nampa	State	Idaho
Location of Job				Sheet No. 10
Estimator	JKB	Estimate No.		
Description of Job				

[illegible]

TEST HOLE DATA			
TEST HOLE #	DEPTH IN FT.	DESCRIPTION OF MATERIALS	DRIILLER'S COMMENTS
1	8.0	Clay and Small Gravels	No Refusal
2	8.0	Clay and Small Gravels	No Refusal
3	3.5	Caliche or Hardpan	Refusal at 3.5'
4	4.0	Hardpan	Refusal at 4'
5	2.5	Basalt	Basalt Flow
6	4.0	Hardpan	Refusal at 4'
7	7.0	Broken Caliche	Refusal at 7'
8	5.0	Caliche	Refusal at 5'
9	2.0	Hardpan	Refusal at 2'
10	4.0	Hardpan	Refusal at 4'
11	3.5	Hardpan	Refusal at 3.5'
12	7.0	Clay and Small Gravels	No Refusal
13	7.0	Clay and Small Gravels	No Refusal
14	3.5	Hardpan	Refusal at 3.5' - Caliche
15	6.0	Clay and Small Gravels	No Refusal
16	7.0	Clay and Small Gravels	No Refusal
17	4.5	Hardpan	Refusal at 4.5' - Caliche
18	3.0	Hardpan	Refusal at 3' - Caliche
19	2.5	Hardpan	Refusal at 2.5' - Caliche
20	3.0	Hardpan	Refusal at 3' - Caliche
21	3.0	Hardpan	Refusal at 3' - Caliche
22	6.0	Basalt	Refusal at 6' - Basalt
23	3.5	Hardpan	Refusal at 3.5' - Caliche
24	5.5	Hardpan	Refusal at 5.5' - Caliche

SYMBOLS

—— GEOTHERMAL SUPPLY

----- GEOTHERMAL RETURN

~~~~~ HEATING SUPPLY

~~~~~ HEATING RETURN

IDAHO STATE SCHOOL & HOSPITAL
Nampa, Idaho

GEOTHERMAL STUDY, BASIC SYSTEM #1

M-1

BALMER/HUBBARD & ASSOC.
MECHANICAL & ELECTRICAL ENGINEERS

800 MCQUELEY ST. ■ P.O. BOX 2007 ■ EUGENE, OREGON 97402 ■ 800-5478

IDAHO STATE SCHOOL
& HOSPITAL
NAMPA, IDAHO
MEDICAL BLDG.

BALZHISER/HUBBARD & ASSOC.
MECHANICAL & ELECTRICAL ENGINEERS

860 MCKINLEY ST. ■ P.O. BOX 2687 ■ EUGENE, OREGON 97402 ■ 686-8478

M-2

M-3

M-4

IDAHO STATE SCHOOL
& HOSPITAL
THERAPY POOL HEATING
NAMPA, IDAHO

BALZHISER/HUBBARD & ASSOC.
MECHANICAL & ELECTRICAL ENGINEERS

880 McKinley St. ■ P.O. BOX 2887 ■ EUGENE, OREGON 97402 ■ 686-8478

M-5

IDAHO STATE SCHOOL
& HOSPITAL
Nampa, IDAHO
BLDG. 1R RESIDENCE

BALZHISER/HUBBARD & ASSOC.
MECHANICAL & ELECTRICAL ENGINEERS

880 McKINLEY ST. ■ P.O. BOX 2087 ■ EUGENE, OREGON 97402 ■ 886-8478

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IDAHO STATE SCHOOL
& HOSPITAL
NAMPA, IDAHO
BLDG. 5 & 7

SALZHSISER/HUBBARD & ASSOC.
MECHANICAL & ELECTRICAL ENGINEERS

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M-7

IDAHO STATE SCHOOL
& HOSPITAL
NAMPRA, IDAHO
HEAD END SYSTEM #1

BALCHIER/HUBBARD & ASSOC.
MECHANICAL & ELECTRICAL ENGINEERS

800 MONKEY ST. ■ P.O. BOX 2887 ■ EUGENE, OREGON 97402 ■ 904-4475

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IDAHO STATE SCHOOL
 & HOSPITAL
 Nampa, IDAHO
 HEAD END SYSTEM #2

800 MCINLEY ST. ■ P.O. BOX 2867 ■ EUGENE, OREGON 97402 ■ 606-4478

BALZISER/HUBBARD & ASSOC.
 MECHANICAL & ELECTRICAL ENGINEERS

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SITE PLAN
P-1001

TEST HOLE DATA			
TEST HOLE #	DEPTH IN FT.	DESCRIPTION OF MATERIALS	DRILLER'S COMMENTS
1	8.0	Clay and Small Gravel	No Refusal
2	8.0	Clay and Small Gravel	No Refusal
3	3.5	Caliche or Hardpan	Refusal at 3.5'
4	4.0	Hardpan	Refusal at 4'
5	2.5	Basalt	Basalt Flow
6	4.0	Hardpan	Refusal at 4'
7	7.0	Broken Caliche	Refusal at 7'
8	5.0	Caliche	Refusal at 5'
9	2.0	Hardpan	Refusal at 2'
10	4.0	Hardpan	Refusal at 4'
11	3.5	Hardpan	Refusal at 3.5'
12	7.0	Clay and Small Gravel	No Refusal
13	7.0	Clay and Small Gravel	No Refusal
14	2.5	Hardpan	Refusal at 3.5' - Caliche
15	6.0	Clay and Small Gravel	No Refusal
16	7.0	Clay and Small Gravel	No Refusal
17	4.5	Hardpan	Refusal at 4.5' - Caliche
18	3.0	Hardpan	Refusal at 3' - Caliche
19	2.5	Hardpan	Refusal at 2.5' - Caliche
20	3.0	Hardpan	Refusal at 3' - Caliche
21	3.0	Hardpan	Refusal at 3' - Caliche
22	6.0	Basalt	Refusal at 6' - Basalt
23	3.5	Hardpan	Refusal at 3.5' - Caliche
24	5.5	Hardpan	Refusal at 5.5' - Caliche

SYMBOLS

- HOT WATER SUPPLY
- HOT WATER RETURN
- ~~~~~ GEOTHERMAL SUPPLY
- +---+--- GEOTHERMAL RETURN

IDAHO STATE SCHOOL & HOSPITAL
Nampa, Idaho

GEOTHERMAL STUDY, BASIC SYSTEM #2

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GALZINER/HUBBARD & ASSOC.
MECHANICAL & ELECTRICAL ENGINEERS

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