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IDAHO HOT WATER PROSPECTORS: Case History

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ABSTRACT

In 1890, four Idahoans set the stage for the nation's current interest in geothermally heating buildings and homes. These pioneers of hot water prospecting were W.H. Ridenbaugh, H.B. Eastman, Timothy Regan, and J.W. Cunningham. The east end of the Boise valley had long been recognized for the pecular plot of land that always seemed to be warm and free of snow in the coldest of winter months. There the team of hot water prospectors drilled two, four hundred feet deep, six inch wells. The reward for such an imaginative and globally unprecedented effort was a gushing daily output of 800,000 gallons of 172° water, and what may soon become the largest direct use geothermal system in the nation.

During the innovative period that followed, there was incalculable hardships and costly experimentations. There was no existing information to guide them on their doubtful endeavor. How long would the water last? Would the temperature fluctuate or just drop completely? They sold off the property to the Artesian Hot and Cold Water Company the following year.

The Artesian Hot and Cold Water Company began building Boise's legendary Natatorium. The structure, of Moorish design and extraordinary beauty, opened it's doors in the spring of 1892 to a town of 2,500. Proudly billed as the "Largest and Finest Natural Hot Water Plunge in the West", it soon featured facilities for steam vapor, shower and tub baths, electric hair dryers, (for the ladies), an immense dancing balcony, lavish parlors, billiard and card rooms and was instantly hosting continuous large-scale social functions. Such functions included several inaugural balls which were ingeniously facilitated by draining the pool and covering it with sectional flooring supported by trestles placed in the "big plunge".

Earlier that same year (1892), C.W. Moore, the founder of Idaho First National Bank, just completed the construction of a French Chateau style home that still stands at 1109 Warm Springs Avenue. He had his home outfitted specifically for geothermal heating, which was supplied by the same main that fed the Natatorium. C.W. Moore's home was the very first residence in the entire nation to be geothermally heated. By 1925, that same system had expanded to become the Boise Warm Springs Water District, serving 170 homes in Boise's East end. It had grown to include two 16 inch wells equipped with Byron Jackson five stage electrically driven centrifugal pumps, producing a continuous flow of 1,200,000 gallons of water per day at the constant temperature of 172¼ F.; nearly ten miles of steel main ranging from 12 to 2 inches in diameter, and the Boise Natatorium supplied with a 4-inch main.

Today, geothermal space heating is an important consideration in the national energy policy. The system of using geothermal energy that Boise is about to implement, will be the first and largest scale, low temperature, direct use application of geothermal energy outside of Reykjavik, Iceland. Boise is a prototype for the nation and its success or failure, therefore, has a distinct and important national impact. If such a large system can succeed technically, legally, and organizationally in Boise, the chances of doing the same thing elsewhere are very high. It is hoped that geothermal systems can and will make a highly substantial contribution to the nation's energy policy.

The Foothills Fault provides the conduit for the upward migration of much of the geothermal water that occurs along the Boise front and is used for the thermal development of what is now the Boise Warm Springs Water District. The Foothills Fault can be traced on the surface for several miles and may continue to the vicinity of King Hill. It is a zone of fractures several hundred yards wide that extend deep enough into the earth's crust to allow vertical migration of meteoric water to great depths, thus allowing it to be heated and returned to the near surface where it can be tapped by relatively shallow wells, about 1,500 feet in depth.

The primary target for exploration of Boise's geothermal resources are: 1) Military Reserve Park which is in closest proximity to most of the prime potential users; this includes the State and Federal building complexes, as well as downtown Boise and the BSU campus; 2) Camels Back Park in Boise's North End and, 3) the Old Penitentiary site in Boise's East End.

Presently, the only commercial size structure in Boise utilizing geothermal heating is the Idaho State Health Lab off the Old Penitentiary Road. The University of Idaho is continuously monitoring a data system attached to the geothermal heat plant for that building. The experience acquired at this building is providing the essential data that Idaho will use for retrofitting its Capitol Mall buildings to geothermal heating.

On September 30, 1976, the Office of Project Planning completed work on a report on long range building plans. During this project period, the State of Idaho embarked on a long range building program. Geothermal potential in the Capitol City and the need for leadership in energy conservation of office facilities, provided an additional focus for the project.

Since the 1972 Arab Oil Embargo, renewed interest of Geothermal resources by Idaho's public sector has continually grown. This interest has primarily centered on the utilization of warm water wells to heat Idaho's Capitol Mall building complex, as well as other buildings in the surrounding central business district.

In 1975, Boise State University and Aerojet General Company received a $250,000 grant from the Energy Research and Development Administration north of the Capitol Mall as a study area for geothermal development. This resulted in two successful exploration holes which yielded 170 degree water at approximate depths of 1500 ft.

Idaho's geothermal program was further enhanced through the support of Gov. Cecil Andrus in his State of the State message of January 5, 1976, when he said:

> "I believe that State government should set an example in encouraging the use of alternative sources of energy for heating and cooling State buildings. In Boise, we may use geothermal energy to heat and cool buildings in the Capitol Mall."

The following table will further identify the proposed buildings to be heated, their Peak Heat Demand (BTU/hr.), and their Geothermal Water Demand (gpm): (also see map page 4)

CAPITOL MALL COMPLEX BLDGS.	PEAK HEAT DEMAND (BTU/hr)	GEOTHERMAL WATER DEMAND (gpm)
1. Idaho State Capitol	2,250,000	227
2. Len B. Jordan Bldg.	6,370,000	255
3. "Hall of Mirrors" Bldg.	1,800,000	120
4. "Twin Towers" Bldg.	5,240,000	250
5. Idaho Supreme Court	3,720,000	149
6. Idaho State Library	5,100,000	170
7. State Veterans Home	4,340,000	438
sub totals	28,820,000	1,609
OTHER C.B.D. BUILDINGS		
8. Boise City Hall	950,660	96
9. Ada County Admin. Bldg.	1,035,100	72
10. North Jr. High School	2,414,700	123
11. Y.M.C.A.	7,331,000	375
12. Hotel Boise	1,500,000	76
13. Idaho First Nat'l Bank	5,930,000	310
14. Bank of Idaho	5,794,300	345
sub totals	24,955,760	1,397
Total	53,775,760	3,006

The 1979 Legislative session passed Senate Bill No. 1237, Section 2, which appropriated from the Public Building Account to the Division of Public Works and the Permanent Building Fund Advisory Council $194,400 for the Geothermal Retrofit of the Capitol Mall. 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 Advisory Council. 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.

The actual retrofit construction should occur sometime between April and November, 1981. Because of the size of the project and the design of the present heating system, only half of the Capitol Mall would be retrofitted during the 1981 construction season, with the remaining buildings to be retrofitted during the 1982 construction season. Therefore, the entire Capitol Mall should be "on-line" during the 1982-83 heating season.

The projected cost of heating the Capitol 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.

There are three potential suppliers of geothermal energy to the Capitol Mall. The first being the State well which is located less than one mile east of the two Boise Warm Springs Water District wells. The second, of course, being the Boise Warm Springs Water District, and the third being the Boise City Geothermal System with potential production well sites located north and northwest of the Capitol Mall.

An immediate potential pooling/supplier of geothermal space heating energy for the Capitol Mall is one of the oldest geothermal energy suppliers in the nation, the Boise Warm Springs Water District. This political subdivision has been supplying geothermal space heating to approximately 170 homes in Boise's East End for over 40 years. The facilities owned by Boise Warm Springs Water District presently include two operating geothermal wells, pumps, associated controls, geothermal pipelines, valves and distribution piping. Major portions of this system are the original equipment. The natural electrolytic process has all but eaten through the original pipes from the outside. The interior of these old cast-iron pipes is as clean as when they were originally dropped into the ground. The entire system will be rehabilitated over the next three year period, which will include the rebuilding of the current production wells and the drilling of a third production well.

The second potential pooling/supplier of geothermal space heating energy for the Capitol Mall includes the Boise City Geothermal System. The unified development of the Boise geothermal resources will soon include the drilling and utilization of a new well field and distribution system by the City of Boise. Development of this system may occur in parallel with the retrofit of the Capitol Mall and the rehabilitation of the Warm Springs Water District. Construction of the Boise City Geothermal System should begin in the fall of 1979 with the drilling of two production wells, proceed with the drilling of injection/disposal wells in 1980, and finish with the construction of a pump station and service lines by October, 1981. Ultimately, final construction efforts should include connecting the previously described buildings (see page 2) to the geothermal system and interconnecting the Boise mainlines and disposal lines with the Warm Springs Water District lines which will, in turn, be connected by 2,000 feet of asbestos concrete piping to the State's geothermal well in east Boise.

A timely, unified development of a Boise geothermal district heating system depends on parallel completion of several critical tasks by the State of Idaho, the Boise Warm Springs Water District, and the City of Boise. Critical to the timetable for retrofit of the Capitol Mall is the timely completion of both the Boise Warm Springs Water District and Boise City Geothermal Systems coordinated drilling activities. Drilling activities should be scheduled such that when drilling has been completed at one site, the drill rig can be immediately moved to the next location.

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 feel are anticipated for production wells and 1,000 feet for injection wells. Planned coordination of the drilling program will reduce cost due to delays as well as the mobilization and demobilization cost of drilling.

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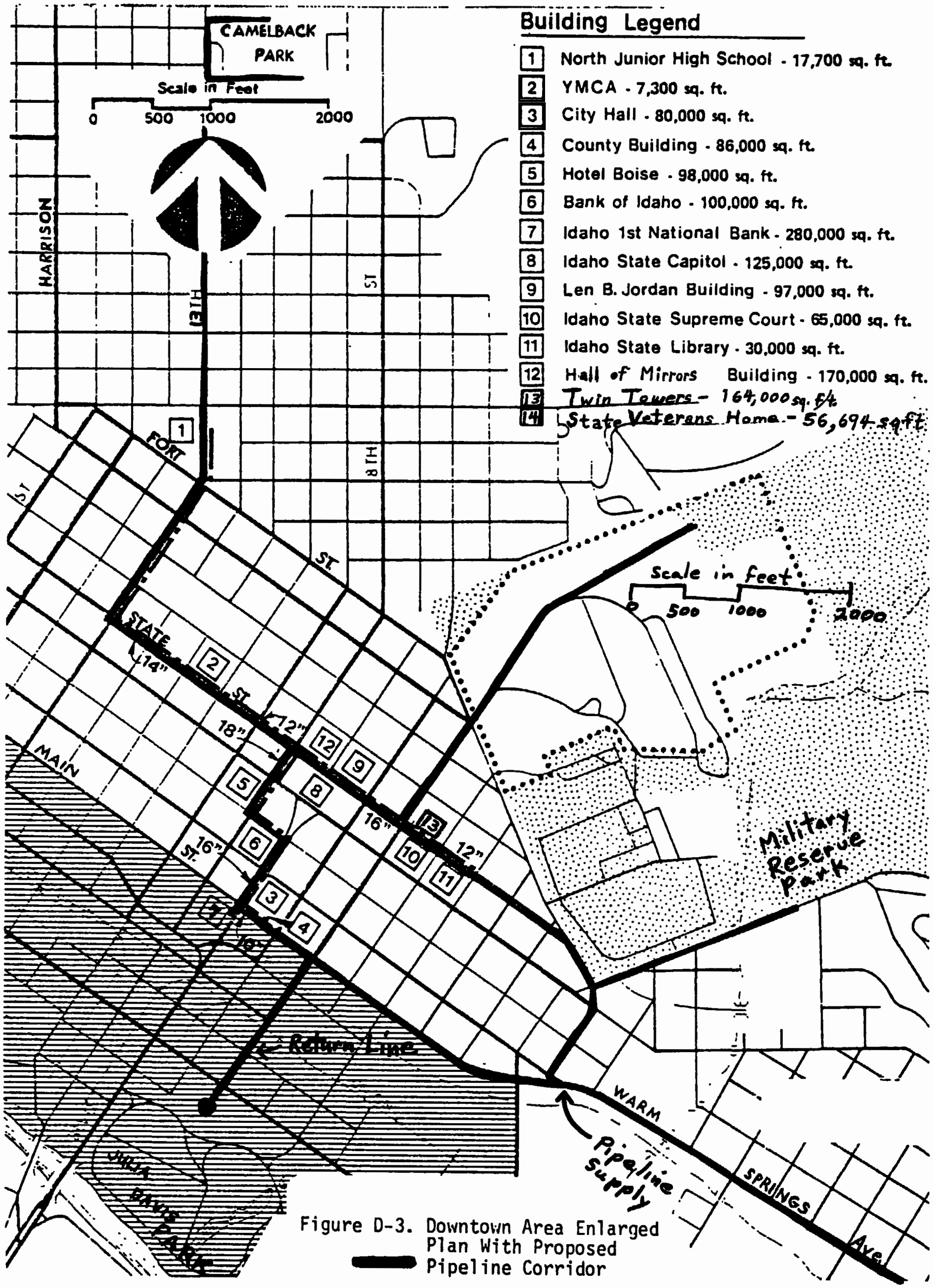

Figure D-3. Downtown Area Enlarged Plan With Proposed Pipeline Corridor