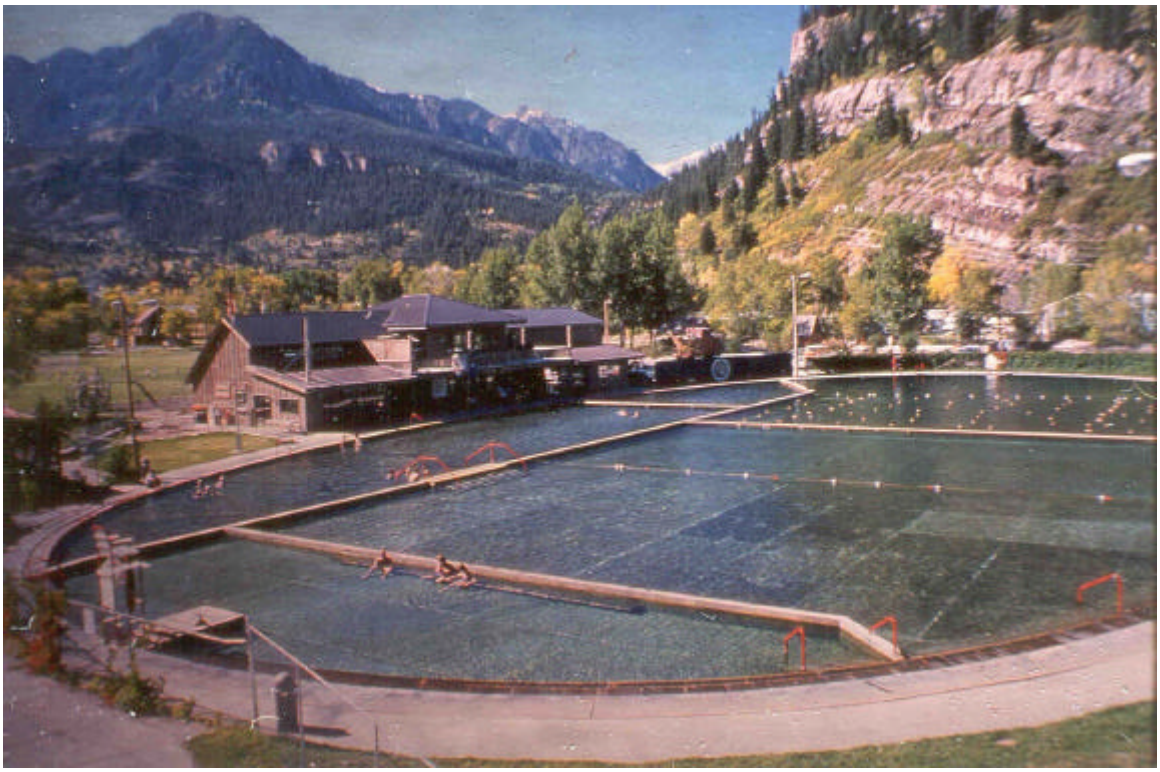
OURAY HOT SPRINGS POOL
OURAY, COLORADO



LOCATION

The Ouray Hot Springs Pool is located on U.S. Highway 505 at the north end of the town of Ouray (about midway between Durango and Grand Junction). At an elevation of approximately 8,000 ft, the town is located in a valley surrounded by the 12,000 to 13,000 ft peaks of the San Juan Mountains making for an impressive setting. The original construction of the 125 x 150-ft ellipse shaped pool was completed in 1927 by the Ouray Recreation Association After two years of operation, the pool was taken over by the city and has been operated as a public facility ever since.

RESOURCE

Numerous hot springs issue from locations both in and around the town of Ouray. These springs typically produce fluids in the 80 to 150°F range depending on location and are used for heating the pool and some local privately owned spas and motels. The original plan was to use water from a resource on the pool site. Unfortunately, this proved insufficient so a trench was constructed to bring water from the Box Canyon Spring, approximately one mile to the south, to the pool. This resource proved to be sufficient to allow operation of the pool during the warmer months of the year and eventually the trench was converted to a pipeline. In the 1980s, the town decided to explore the development of a district heating system. Six test wells were drilled, two of which were near the pool. Though the district heating system was not developed, one of the wells is used to supply water to the pool and this additional source is sufficient to permit year round operation. At present, the pool receives approximately 120 gpm of 145°F water through a pipeline from the Box Canyon Spring and approximately 134 gpm at 124°F from well OX-2. The water chemistry for the springs varies somewhat, but is very hard (500 to 1,000 pm as $CaCO_3$), TDS of approximately 1,000 to 2,000; pH of 7 (field) and 8 (lab) and 500 to 1,000 ppm sulfate. Scaling is a problem in most cases.

UTILIZATION

Water from the two sources described above is supplied to the pool and in the winter months to a heating system for the pool buildings (totaling approximately 5700 sq ft). For the pool itself, the combined flow from the spring and the well is delivered to a concrete tank on the west side of the facility. Here chlorine is added and the water is pumped to the filter room. The geothermal water is passed through two sand pre-filters to remove iron and manganese and then is mixed with pool water after it has passed through the main filters. Three distinct temperature zones are maintained in the pool--a smaller 104°F section, a larger 98°F section and the main portion of the pool is allowed to "float" using whatever geothermal water is left after satisfying the warmer sections.

Temperature is maintained by manually adjusting valves which mix the geothermal water with the filtered pool water. Overflow from the pool is delivered to the Uncompagre River located adjacent to the facility.

In addition to the pool heating, a small flow is diverted from the Box Canyon Spring line to provide heating of the pool building. Geothermal water is supplied to a plate heat exchanger at a rate of 90 gpm. The heat exchanger produces 110°F water which is circulated to the radiant floor/fan coil system in the building. This system provides approximately 288,000 Btu/hr (0.1 MWt) to the building with an annual use of 0.6 billion Btu. Assuming an average pool temperature of 75°F and an average air temperature of 50°F, the peak load is then estimated at 6.0 million Btu/hr (1.8 MWt). At 8,000 hours per year (assuming a few hours in the dead of summer where minimal heat is required), the estimated annual heating use is 48,000 billion Btu.

OPERATING COSTS

No pumping of the geothermal fluids for this facility is required. The spring is located uphill from the pool and flows by gravity through the pipeline. Well OX-2 is artesian and no additional pumping is required. The only pump located on the geothermal side of the system is the one that transfers the water from the concrete tank to the pool filter room. The 15-hp pump operates continuously resulting in an annual cost of approximately $7,800. Aside from this, regular maintenance consists of replacing the sand in the geothermal pre-filters every six months. Once a year, the plate heat exchanger must be cleaned and descaled and this incurs a cost of $200. The original asbestos cement pipeline from the spring was replaced recently with 10" PVC material at a cost of approximately $20,000. Periodic descaling of the pipeline is performed annually at a cost of about $500. The total budget to operate the pool amounts to approximately $540,000 per year and revenues from its operation are $660,000 per year.

REGULATORY/ENVIRONMENTAL ISSUES

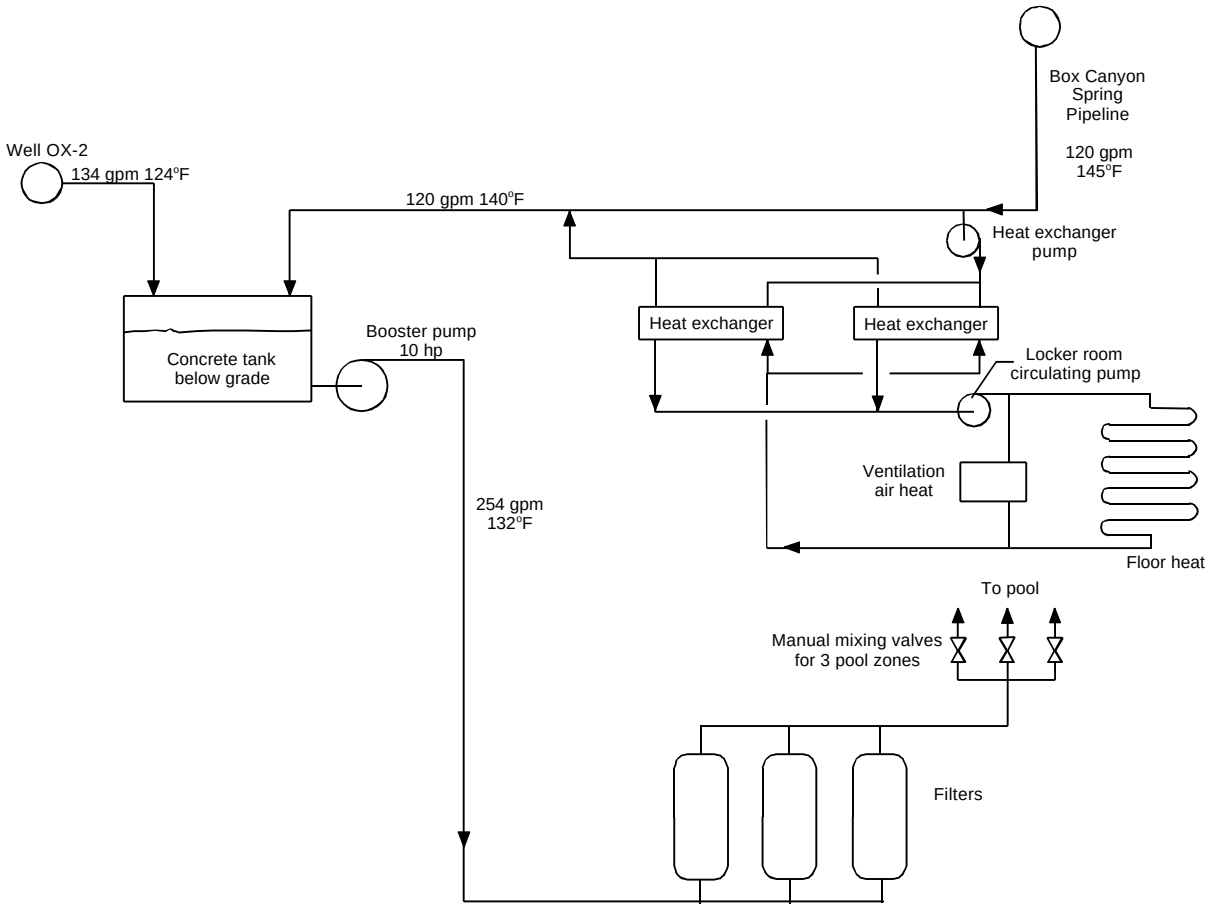
Since the pool was established in 1927, it existed long before most regulatory agencies and rules were developed. The pool operates as a "flow through" design and disposes directly to the Uncompagre River. This river does not support a fish population due to its natural water chemistry. In recent years, a chlorination system has been added to the pool and a residual chlorine level of 1.0 ppm is maintained in the pool water. This is well below the level required in conventional pools. Disposal of the water to the river is governed by a state surface disposal permit which specifies flow, TDS, temperature, chlorine and ammonia limitations.

PROBLEMS AND SOLUTIONS

The very simple nature of the system results in a low incidence of operating problems at the facility. Other than the replacement of the pipeline mentioned in the above section, no major mechanical issues have surfaced with the system.

The drilling done by the town in the 1980s, though not directly connected with the pool, did cause some problem with one local spa. The spa claimed damage to their spring flow from the test drilling and a legal agreement was developed with the town to supply a small flow (30 gpm) to the spa owner as compensation. At this writing, a pipeline is being designed to deliver the flow from the existing Box Canyon line supplying the pool.

Conclusions and Recommendations: The pool is a very successful operation and one which generates substantial tourist activity for the town--the primary industry in Ouray. Given the age of the pool, the low level of maintenance is impressive.



Ouray Hot Springs Pool Schematic