

**LeRoy W. Hooton, Jr.**

## **INTRODUCTION**

**The Metropolitan Water District of Salt Lake City was formed in 1934 to participate in the Provo River Project. However to fully understand the genius of the district, the story begins in the late 1920s when Salt Lake City began to search for additional water supply. At this point in its water development history, the city had entered into exchange agreements with nearly all the farmers who had appropriated the waters of Parleys, Mill Creek, Big Cottonwood and Little Cottonwood creeks. There were a number of ditches that had not exchanged their water, but for the most part nearly all the waters from the Wasatch Canyons were acquired.**

**The Jordan and Salt Lake City Canal and the East Jordan Canal Extension conveyed irrigation water from Utah Lake and the Jordan River to make the exchanges. The 6200 South Pumping Plant lifted water to the high benches allowing the City to exchange water with nearly all of the ditches along the east side of the valley from Little Cottonwood Creek northward.**

**Despite the exchange agreements, the city began to run out of water. A growing population was stressing existing supplies and equally as important, the need to protect**

against water shortages due to annual stream flow variations inherent with the canyon streams and droughts.

The City had constructed Mt. Dell Dam in Parleys Canyon in 1916, enlarging it in 1927 to a capacity of 3,100 acre-feet of water supply. Lake Mary-Phoebe and Twin Lakes dams were built in Big Cottonwood Canyon to store limited quantities of water to meet late summer demand and droughts. However, these were small storage facilities and had limited storage capacity.

If Salt Lake City was to continue to grow and be the cultural and economic center of the intermountain west, it needed additional water supply, particularly stored water. The following report describes the formation of the Metropolitan Water District of Salt Lake City, its subscription of water in Deer Creek Reservoir, and the construction of the Deer Creek Aqueduct (Salt Lake Aqueduct). The report also notes some of the conflict that arose between the new district board of directors and Salt Lake City Board of Commissioners.

#### **1924 WATER SHORTAGE**

The City's lack of sufficient water supply for the future started to become apparent with the drought of 1924. Water officials such as H. K. Burton, Water Superintendent from 1920 to 1952 began to worry about the City's future. After several years, Superintendent Burton and others laid the foundation for needed action to improve the City's water supply. When Mayor John Bowman was assigned the water department in 1928, he took personal interest in the matter.

#### **1928 WATER ADVISORY BOARD**

Mayor Bowman was immediately began surveying the City's water supply. He consulted with both national and local water engineers, and they all agreed that the City had to look outside of the Jordan River valley for future water supplies. He and his engineering advisors contemplated the construction of a large storage reservoir in the upper reaches of the Weber River with a capacity between 25,000 and 40,000 acre-feet.<sup>1</sup>

Several months later, Mayor John Bowman was convinced that the City's future was in doubt without developing new water supplies. Challenged by the words, "A city can never be greater than its water supply," the most ambitious water development program ever undertaken by the City was initiated.



Mayor John  
Bowman (1928-  
1932)

On May 15, 1928 in an effort to identify new sources of water, Mayor Bowman accepted a Report from H.C. Jessen, City Engineer which read, "With reference to the proposed investigation of outside sources of water supply for Salt Lake City, it is unquestionable that much time and money could be saved if the City secured the services of engineers who are familiar with the water resources in the state."<sup>2</sup> Mayor Bowman moved that the report be concurred in and filed, thus forming a Water Advisory Board to study the matter.

The following instructions were given to the advisory board:

"The Water advisory board was to acquire an adequate water supply for a minimum population of 400,000.

It is proposed that the advisory board will map out a schedule to be followed by an increased force of five or six men in the city engineering corp to determine the cost of bringing new culinary water to the city system. When the work is completed and a decision on which of several proposed water projects will be the most economical to undertake for expanding Salt Lake City's water supply, the citizens will probably be requested to vote upon a bond election.

The cost of the survey work is expected to amount to about \$6,000. With the exception of Mr. Jessen, each member of the advisory board will receive \$50 per day and expenses during the actual days of their services.

Among the projects, which Mayor Bowman said, he would insist upon the board vigorously investigating would be the Duchesne River. Mayor Bowman believes it will be possible to place part of the 50,000 acre feet of surplus water in the Duchesne river into the headwaters of the Provo river during the highwater season and store it at Bates site, Provo Canyon, at a cost of approximately \$3,000,000. If such is found possible, said the mayor, it will give a source of water supply four times larger than the supply that might be drawn from the proposed Argenta reservoir."<sup>3</sup>

## **WATER ADVISORY BOARD**



**The Water Advisory Board consisted of the following members:**

**Left to Right: George M. Bacon, State Engineer, who would later withdraw from the Board**

**Sylvester Q. Cannon, Past City Engineer**

**William Peterson, geologist, and Professor at Utah State Agriculture College in Logan**

**A. Z. Richards, Private Engineer, in the consulting business**

**Right: J.C. Jessen, then City Engineer and chair of the Board**



## **WATER ADVISORY BOARDS' RECOMMENDATIONS**

**Within a year, the Board made its recommendations. In summary the recommendations consisted of the following:**

**Local Sources: Increase the use of local canyon streams and artesian wells. The first priority was to build the 12,000 acre-foot Argenta Dam in Big Cottonwood Canyon.**

**Outside Sources: Nine projects were recommended, including deep wells. The first priority was to purchase 40,000 acre-feet of water in the proposed Deer Creek Reservoir.**

**The full text of the Report is included in the Appendix of this paper.**

### **Water Development Action:**

- 1) **The administration immediately began to explore the purchase of capacity in Deer Creek Reservoir; however, it was estimated that it would not be available for 7 to 10 years, forcing the City to implement the local sources recommendations first.**
- 2) **A \$2 million bond was passed by an election on July 1, 1931 to finance the local measures.**
- 3) **As the drought of the early thirties deepened, deep wells were also drilled.**
- 4) **The Argenta Dam bond election was defeated.**
- 5) **It was determined that a separate entity would have to be formed to participate in the Deer Creek Reservoir Project.**

### **CREATION OF THE METROPOLITAN WATER DISTRICT OF SALT LAKE CITY**

**In order for Salt Lake City to participate in the Deer Creek Project, it was necessary for the City to set up an independent governmental entity to proxy for the City.**

**It was found that municipal corporations, as such, were precluded from participating in federal reclamation projects for the following reasons:**

- 1) **The United States Bureau of Reclamation requires a repayment contract that has a joint and several liability and under the then current Utah laws, cities are not authorized to enter into such a contract.**
- 2) **Should any city issue 10 or 20-year bonds for repayment for water subscribed under the project, not only would the bonds not be acceptable to the United States but the City would be obligated to pay under such bonds annual amounts much greater than the payments required under the Reclamation Bureau plan, i.e. forty equal, annual installments without interest.**
- 3) **Most of the cities under the project would be limited by present bonded indebtedness operating under the present laws applicable to cities and towns, to such extent that they may not legally assume the new obligation required by virtue of their subscriptions of water in the project.**

As a result of the above stated problem, it was decided to enact new legislation, which would permit the organization of Metropolitan Water Districts.<sup>4</sup>

The Metropolitan Water District Act was prepared with the aid of private, leading counsel, the Attorney General's office and the City Attorney. It was passed by the State Legislature in its 1935 session and was declared Constitutional by the Supreme Court of Utah.

The Metropolitan Water District Act as incorporated, shall have the following powers:

Have perpetual succession and sue and be used in all actions and proceedings in court;

Adopt a seal;

Take by grant, purchase, bequeath, devise or lease and to hold, enjoy, lease, sell, encumber, alien or otherwise dispose of water, waterworks, water rights and sources of water supply and any and all real and personal property of any kind within or without the district, etc., and to do and perform any and all things necessary or convenient to the full exercise of the power herein granted;

Have and exercise the power of eminent domain and in the manner provided by law for the condemnation of private property for public use and to take any property necessary to the exercise of the power herein granted;

To occupy streets and public lands; to construct and maintain works and establish and maintain facilities across or along any public street or highway and in, upon or over any vacant public lands and to construct works and establish and maintain facilities across any stream of water or water course;

Borrow money and incur indebtedness and to issue bonds or other evidence of such indebtedness; provided that no district incorporated shall incur indebtedness which, in the aggregate shall exceed 10 percent of the value of the taxable property within the district;

Fix and determine funds required for district purposes and to apportion costs and expenses;

Enter into contracts; employ and retain personal service and employ laborers; establish and maintain offices as shall be necessary;

Acquire water and water rights within or without the State; to develop, store and transport water;

Invest any surplus money and refund any bonded indebtedness incurred by the district.

A special election was held on Thursday, August 15, 1935 to form the new district. The results were closer than expected, with 5,218 voting for, and 4,564 against. This election was held during the worst drought on record, which would have helped the election, but on the other hand, the area was in the midst of the worst of times, the "Great Depression." Nevertheless, the district was formed allowing Salt Lake City to join with

others in the Deer Creek Project, and construct the Salt Lake Aqueduct to convey the water northward to the city.

On August 30, 1935, the Secretary of State issued to Salt Lake City a "Certificate of Incorporation of the Metropolitan Water District of Salt Lake City," in accordance with the provisions of the Metropolitan Water District Act and results of the election held on August 15, 1935.

On September 11, 1935, the Board of City Commissioners passed an ordinance designating the number, tenure of office and qualifications of the Board of Directors for the district. The board would consist of seven members, one whom shall be the Commissioner of Water Supply and Waterworks, the remaining six would be appointed by the Mayor. Under the City Council form of government this responsibility belongs to the City Council. The members of the board shall be selected without regard to political affiliations and shall be of the highest integrity and ability, residing in the Metropolitan Water District, and shall serve without pay.

The first board of directors took office in October 1935 and consisted of the following individuals; Herbert S. Auerbach (1935 - 1941), Sammuel A. Kennedy 1935 - 1953), J. A. Nelson (1935 - 1942), Phil J. Purcell (1935 - 1941), Robert L. Judd (1935 - 1936), and George A. Critchlow (1935 - 1938). George D. Keyser, Commissioner of Water Supply and Waterworks was ex officio of the board (1935 - 1943).

#### **METROPOLITAN WATER DISTRICT COMMISSIONS A WATER STUDY**

One the first things the new board did was to commission a detailed water study. The engineering firm of Alvord, Burdick & Howson Engineering, Chicago, was hired to examine the municipal waterworks system of Salt Lake City to determine the most practicable means for securing an adequate water supply for the future. The report was completed on August 8, 1936, with the recommendation to participate in the Deer Creek Project. The report said, "All the figures indicate to us that the City must proceed with a liberal addition to the water supply, if periodical water shortages are to be avoided. Temporizing with minor additions to the supply will never solve the Salt Lake City water problem. This recommendation was based on the City's current water budget, which

showed that it had a firm supply (dry year) of 35,150 acre-feet of water (primarily from 25 canyon exchange agreements), and used 37,619 acre-feet in 1929. Population projections indicated that the population would increase from 148,000 people to 270,000 people in 1980. Total system capacity would have to increase from 32.6 million gallons per day (36,500 acre-feet) to 68 million gallons per day (76,000 acre-feet) by 1980. The authors, go on to say, "Unless the City of Salt Lake adopts a long range water supply program, its opportunities for the future are quite limited and it is likely to surrender supremacy in the mid-mountain region."<sup>5</sup>

The Report recommended that Salt Lake City participate in the Deer Creek Project for the following reasons:

- 1) In our opinion it will supply Salt Lake City at less annual cost than any other supply.
- 2) It insures an adequate supply of water for Salt Lake City for the indefinite future.
- 3) The water will be cleaner than the present creek supplies and softer than any available ground water.
- 4) It will provide a storage reservoir capacity about twice the present yearly consumption of the City; thus permitting storage in wet years to be used in dry years.
- 5) It helps to augment the water supply of the region adjacent to Salt Lake City thus increasing the population tributary to the city and thus increasing the opportunity for the City to grow.
- 6) The City's participation probably insures the construction of the Deer Creek Project, therefore tending to benefit the City, County and State by increasing the opportunity to gain a livelihood in the Salt Lake region.
- 7) It is the first step in the utilization of Colorado River water in the Salt Lake Valley. Utah should develop these waters before they are appropriated elsewhere.
- 8) This is a semi-arid State. Water is the lifeblood of it. It can progress only if and as the water supply is increased. Without more water there can be no great progress. With water, progress is limited only by the resources to support population; and water will create resources, through agriculture and industry, that will benefit the State, Salt Lake Valley, and the citizens of Salt Lake City.

The firm further noted that there was an opportunity for the City to participate in the Provo River Project on the same basis as the agricultural users, and only until recently were

cities permitted to participate upon this favorable basis. "In our opinion the Deer Creek Project will meet the requirements of the City up until at least 1980," the Report concluded. It further recommended a 54-inch 28-mile aqueduct from the Deer Creek Reservoir to Salt Lake City with a capacity of 126 cubic feet per second.

The Report confirmed the 1928 Water Advisory Boards recommendation to develop water outside of the Jordan River drainage.

## THE PROVO RIVER WATER USERS' ASSOCIATION

The Provo River Water Users' Association was formed in 1935 to sponsor the Provo River Project and contract with the federal government for the repayment of costs. Under the articles of the Association, Metropolitan Water Districts, canal and irrigation companies have a joint obligation to repay the United States the full cost of the Provo River Project. The Association is a Utah nonprofit corporation organized for the purpose of providing supplemental water supply to its shareholders comprised of six metropolitan water districts, one conservation district, seven mutual irrigation companies and two small farming companies within Utah and Salt Lake Counties. The Provo River Project includes, among other things, the 150,000 acre-foot Deer Creek Dam and Reservoir, the enlarged Provo River Canal, the enlarged Weber-Provo Diversion Canal, the Duchesne Tunnel and the Provo River Channel Revision Project. The Association is entitled to use the storage capacity of Deer Creek Reservoir, together with the total yield of storage water therefrom and a permanent right to the exclusive use of the water made available by the project under



Provo River Water Users Board tour of Duchesne Tunnel Diversion (top) and the Weber-Provo River diversion (bottom) - 1992.

the water rights in the name of Reclamation, including diversions from the Weber, Duchesne and Provo Rivers.

## THE 1937 SUBSCRIPTION AND AQUEDUCT CONTRACT ELECTION



In an advertisement Uncle Sam points Salt Lake City voters to the polls and a greater city of the future.

During 1937, the Metropolitan Water District of Salt Lake City scheduled an election to gain voter approval for the subscription of 46,000 acre-feet of Deer Creek water and construction of the Salt Lake Aqueduct at a cost of \$7.5 million repaid in 40 equal installments at no interest. The following information describes the issues and reads:

### What The Deer Creek Water Project Is:

The Deer Creek reservoir and aqueduct are units of a water project to be constructed by the United States Bureau of Reclamation. The reservoir will be built in Provo Canyon just above Vivian Park and will have a capacity of 150,000-acre feet. This is 43 times as much water as can be stored in Mountain Dell reservoir in Parleys canyon. The water impounded at full capacity will form a lake seven miles long, three-quarters of a mile wide and varying in depth from 150 feet to about 40 feet. The vast supply will be held in reserve for use by Salt Lake City and agricultural communities in Utah, Summit and Wasatch counties. The other unit of the project, the Salt Lake Valley Aqueduct, also will be constructed by the United States government.

It will extend along a 40-mile route from the Deer Creek reservoir to permit delivery of water to Salt Lake City and to suburban farmland in the southeast section of Salt Lake valley.

For purposes of comparison, one-acre foot of water is equivalent to 325,851 gallons. Salt Lake City now requires approximately ELEVEN BILLION gallons of water annually, or about 34,000 acre feet.

**Where the Water Will Be Obtained:**

The water to be stored in the Deer Creek reservoir will be obtained from two principal sources. The Duchesne River in the Uintah Basin, and the Weber River at a point near Oakley. Approximately 54,000 acre feet of flood water and 20,000 acre feet of winter power water will be diverted from the Weber River annually by means of enlarging a small canal on the Kamas bench, which was constructed several years ago by the Reclamation bureau. Approximately 30,000-acre feet will be obtained from Duchesne River by means of a tunnel linking the Duchesne to the Provo River. This water also is surplus floodwater, now lost in the Colorado River. Additional water is to be obtained from the Provo River in lieu of return flow from the reservoir, so that the average annual inflow will exceed 100,000-acre feet. In “wet years” the flow will greatly exceed this total, thus permitting 50,000 acre feet of storage to be held over for us in “drouth” years.

**The Nov. 23 Election And Why It Was Called:**

On November 23 the taxpaying electorate of Salt Lake City will be called upon to decide whether we shall accept the offer to participate in the reservoir and aqueduct development. “Yes” votes will give authority for the Metropolitan Water District of Salt Lake City to purchase, on behalf of the citizens of salt Lake City, not more than 50,000 acre feet in the reservoir and to contract with the government for building the aqueduct.

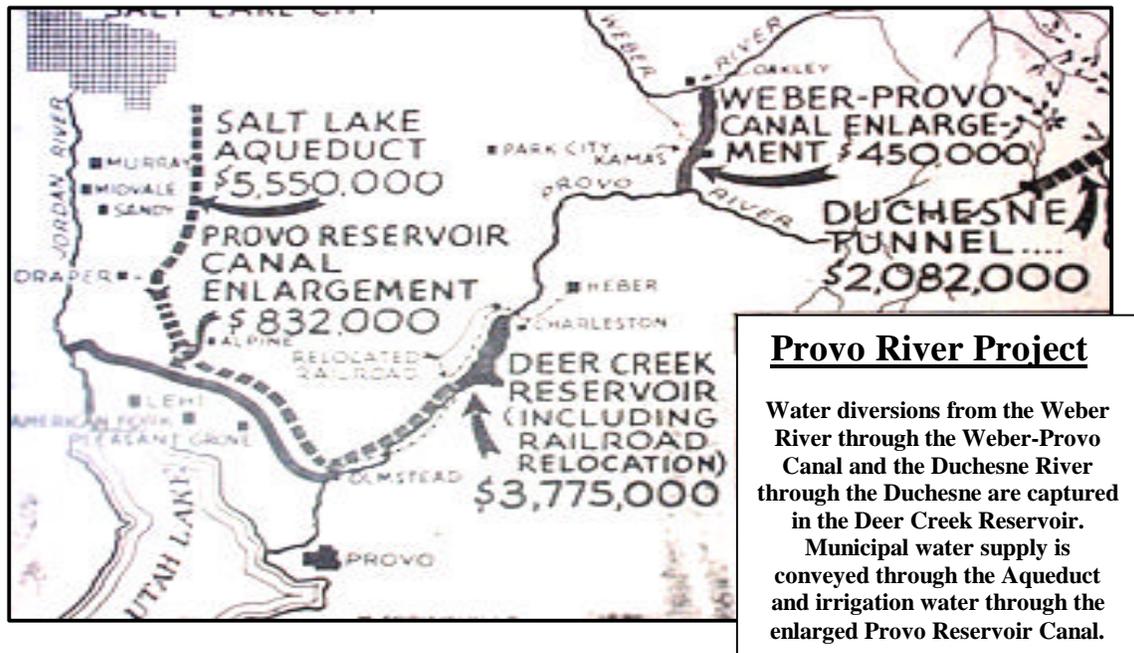
Because of the fact that no interest will be charged, there will be no bond issue such as the city had had before it in the past. It will simply be authority to enter a contract with the United Sates Government and the Provo River Water Users Association, comprising other prospective users, whereby we agree to pay back our proportionate share of the expense in forty equal annual installments, without interest.

**To Get Deer Creek Water You Must Vote:**

The ballot will contain two questions: One authorizing a subscription for the water and the other authorizing a contract for construction of the aqueduct. Your “Yes” vote on the first question will authorize purchase of the water; your “Yes” vote on the second question will authorize signing of the aqueduct contract.

On August 6, 1937 the United States ratified the Deer Creek repayment contract. According to news reports, "The Provo River (Deer Creek) reclamation project advanced a

step closer to actual construction Friday afternoon when final approval was given by the Secretary of Interior's office to the supplemental repayment contract between the United States and the Provo river Water Users' Association. The supplemental contract, together with subscription contracts to be executed by member-groups of the water user's association, guarantee the repayment of the cost of the project to the government. It was hailed by Fisher Harris, director of the association and counsel for the Salt Lake City Metropolitan Water District, as "meaning a great deal to Salt Lake City and the state of Utah."<sup>6</sup>



The election was set for November 23, 1937. During the months leading up to the election, federal, state and local officials flocked to podiums across the city to support the election.

U.S. Senator Elbert D. Thomas spoke in favor of the project. His comments described the project from a national viewpoint and in the context of federal reclamation law. "Speaking before the Kiwanis Club in the Hotel Utah, Senator Thomas said that Salt Lake City is one of the most fortunate cities in the country because it has been given an opportunity to obtain the additional water it needs on the same terms under which farmers can purchase irrigation water. Other cities are almost constantly clamoring, without avail, at the doorstep of congress for the benefit of the terms offered freely to Salt Lake City, the senator asserted." The senator in explaining why the government offered Salt Lake City

the opportunity to buy Deer Creek water with the aqueduct gave three reasons. "In the first place," he explained, "the Deer Creek project happily falls within reclamation law provisions permitting the sale to municipalities of any water in excess of agricultural needs, which means that Salt Lake City will be able to obtain a large and safe water supply to meet its present and future needs." Secondly, he continued, "if Salt Lake City does not take advantage of this opportunity, it must of necessity encroach on irrigation farmers in Salt Lake valley in its quest for an additional water supply. Thus, the farmer will be assured security." As a third reason, the he contended, "that Salt Lake City will sell part of the water it will obtain through the Deer Creek project to residents on the southeast bench lands, who can obtain new water in no other way, and thus reduce the total cost of the project to the city, besides developing a rich agricultural area."<sup>7</sup>



Left to Right: Phil J. Purcell, Governor Henry H. Blood and S. A. Kennedy campaigning for yes vote.

Reclamation Chief John C. Page urged support of the election, "Whether Colorado river water is diverted into the Great Salt Lake valley for irrigation through the Deer Creek project depends on whether the Salt Lake metropolitan water district subscribes its 44,000 acre feet quota for use of the water." Later in September, he warned that Congress

could divert the construction funds to other projects. He concluded, "That the work start this year is vital because of a constant fight in congress for funds"<sup>8</sup>

Governor Henry H. Blood strongly supported the project and voiced his concern over the state getting its share of the Colorado River. "I think we may grant two premises that are fundamental." Governor Blood said. "First: Salt Lake City and Utah must grow. Second: If they are to grow, they must have more water. Now, if you must have more water, where are you going to get it? Not from the local mountain streams, because they are all in use and have proved inadequate in time of need. Not from Utah lake, because it was pumped dry, practically speaking, in 1934-35 and still the water was not sufficient. Not from underground sources,

" If we do not take Colorado River Basin water now, we may never have the chance again."  
Governor Blood

because they, too, are in use. What is needed is a new supply from outside the Great Basin. Where are you going to get the water then? The present answer must be: From the Deer Creek project, or not at all.” He talked about future problems diverting water from the Colorado River. “Developments are now coming fast along the Colorado River,” he warned. Continuing he said, “One thing is as sure as fate: Just as soon as it can be shown that substantially the entire flow of the Colorado River is being put to beneficial use there will be hard-fought opposition to any attempt to make further diversions of water from the river or any of its tributary streams. It is possible now, if Salt Lake City votes favorably, to divert Colorado River water from the Duchesne River, a tributary, and convey it outside the Colorado River basin and into the Salt Lake basin, as is contemplated in the present case. Whether this will be possible 10 or 20 years from now, who will predict? Interstate and even international complications might arise to prevent what now can be done. If we do not take Colorado river basin water now, we may never have the chance again.”<sup>9</sup>

Attorney Ray Van Cott made the analogy between Salt Lake City and Deer Creek to Los Angeles and Hoover Dam. “Terming the reservoir the “Boulder dam of Utah,” Mr. Van Cott charged the Junior Chamber of Commerce to “wake up Salt Lake City voters and make them realize that if they don’t support this project the city may lose the greatest opportunity it has ever had.” Addressing a luncheon at the Beau Brummel café, Mr. Van Cott explained that Los Angeles must bear the interest cost on Boulder dam, while Salt Lake City will not have to pay one cent of interest on Deer Creek.” He continued, “Los Angeles is spending millions because its citizens have confidence in the future...”<sup>10</sup>

**"The Project [Deer Creek Dam] will mean to Salt Lake City almost the same thing that Boulder dam means to Los Angeles..."  
Attorney Ray Van Cott**

The Salt Lake City Engineering Department prepared a study on Deer Creek and determined that the 44,000 acre-feet of project water would insure the city a water supply sufficient for a population of approximately 315,000 inhabitants. The study, under the direction of City Engineer W. D Beers, showed that with Deer Creek in conjunction with the City's rights,

**"The Deer Creek water supply in junction with the City's water rights amount to 90,000 acre-feet annually, sufficient for a city of 400,000"  
City Engineer W. B. Beers**

a culinary water supply of 90,000 acre-feet annually, or sufficient water for a city of approximately 400,000.<sup>11</sup>

Others from Unions, business community, farmers, and city government advocated their support for the project. According to others, property values would increase; the project would provide new jobs and new business opportunities. Near the election, the LDS Church came out publicly in support of the propositions. Opposition to the propositions was conspicuously absent.

The vote was overwhelming in favor of the propositions. Both won approval by a whopping 23 to 1 ratio.

Proposition No. 1 -- Yes, 13,963; No. 623. Proposition No. 2 -- Yes, 14,062; No. 616.

On December 1, 1937, the district entered into a formal contract with the Provo River Water Users Association for the purchase of 46,000 shares of capital stock. The subscription was the largest single share of the 100,000 shares available.<sup>12</sup>

## CONSTRUCTION OF DEER CREEK PROJECT

With the vote, work began on Deer Creek the following spring. The first task was to clear the dam and reservoir site. CCC workers cleared the land over which the waters would cover. All trees and undergrowth had to be removed, dug to a depth of three feet, disinfected and puddled in clay before the water would be allowed behind the dam. The men engaged in this work were housed at a camp located in Heber City, just south of town. Workers were experienced in their tasks, as they had just finished the Pine View dam in Ogden Canyon the year before.<sup>13</sup>



"Before the construction began,

Deer Creek dam under construction during 1941.

the Deer Creek damsite was a quiet spot, a gathering place for picnickers, anglers or hikers. As the construction activity moved forward, the canyon echoed and re-echoed with the sounds of jackhammers, the thundering of dynamite, the puffs and snorts of huge steamshovels and the endless chugging of "cats" and dump trucks," wrote H.C. Godbe, Secretary of the district. Work began during March of 1938, shortly after the United States Bureau of Reclamation awarded the contract to the Rohl-Connolly Company of Los Angeles.<sup>14</sup>

Work progressed on relocating the highway and the Denver & Rio Grande Western railroad tracks.

According to Mr. Godbe, "The dam will rise 155 feet from the stream bed. It will be about 1,000 feet thick at the base and 75 feet thick at maximum water level; 1,400 feet between walls and will require about 3,000,000 cubic yards of fill. At maximum capacity it



The Deer Creek Aqueduct (Salt Lake Aqueduct) Alpine Tunnel work during the summer of 1939.

will impound 150,000 acre feet of water, of which 50,000 acre feet is reserve capacity." He continued, "the district has contracted for 46,000 shares of stock in the Provo River Water Users' Association, the contracting and operating agency for the reservoir, and on that basis will receive 46,000 acre feet of the 100,000 acre feet annual yield. The cost to Salt Lake City is \$3,496,000 for its share of the water. This water will be brought to Salt Lake Valley for agricultural and domestic use

through an aqueduct which probably will cost an additional \$5,550,000, the expense of which will be borne by the Metropolitan Water District. The total sum is \$9,046,000."<sup>15</sup>

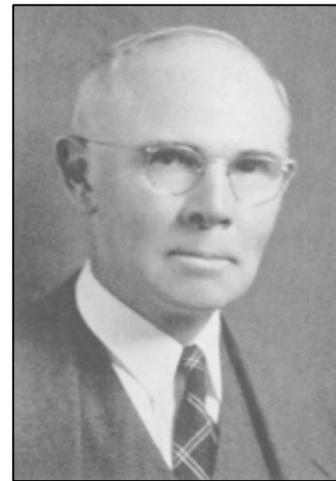
Deer Creek dam and reservoir was completed in the fall of 1941. By the end of that year progress had been made on the Duchesne Tunnel and the Deer Creek Aqueduct (Salt Lake Aqueduct). The 9-mile Weber-Provo Diversion from the Weber River to the Provo River was completed in 1948. The 6-mile Duchesne Tunnel from the North Fork of the Duchesne River to the headwaters of the Provo River was completed in 1953, with water first diverted on October 17, 1953.

The Salt Lake Aqueduct was completed in the fall of 1950. Water from Deer Creek was delivered in 1951. The 40 million-gallon Terminal Reservoir, near the mouth of Parleys Canyon was under construction in 1951. The 100 million-gallon per day Little Cottonwood Water Treatment Plant was put into service in 1960. Costing \$7.5 million, Salt Lake City taxpayers approved the bond by an 8 to 1 vote.

## TROUBLED WATERS

During the early 1940s conflict developed between the City and the District. Not to speculate on the reasons, there appeared to be friction between George D. Keyser, City Commissioner over the Water Department and ex-officio board member and the district board. According to newspaper accounts of the period, there were a number of issues that pitted Keyser and the City against the district board.

George D. Keyser, an engineer, received his Bachelor of Science degree as a Civil Engineer at Harvard University. He was one the first five Commissioners, elected in 1911, to inaugurate the City Commission form of government in January 1912. He held a 2-year term. He served in the military, earning the rank of lieutenant. A businessman, he again was elected to the Salt Lake Commission in January 1932, where he served as Commissioner of Water Supply and Waterworks.



Water Commission George D. Keyser (1935 - 1943)

On the Metropolitan Water District side were Fisher Harris and Blair Richardson, chairman of the board of directors. Fisher Harris was Salt Lake City Attorney from 1932 to 1940 and played a key role in forming the Metropolitan Water District of Salt Lake City and later in acquiring water from the Deer Creek Project. Subsequently he moved to the district and became its manager in 1941 in a controversial board decision. Before assuming public office he had practiced law in Salt Lake City for 16 years. He held the rank of first lieutenant during World War I.

The conflict, in part, centered on the independence of the board of directors and the elected officials of Salt Lake City, embodied in Water Commissioner George G. Keyser. First, a creation of the Salt Lake City, the district was formed to participate in the Deer Creek Project, but as time passed, the board began to make decisions that were viewed as contrary to Salt Lake City's best interests. Perhaps it was a natural evolution of the two entities. The district board, taking independent action that they deemed their prerogative under the Metropolitan Water Act, ran against the long-standing prerogatives of Salt Lake City government. Ultimately harmony returned to the two entities. However, the City Commission did impose some control over the board by reducing the size and tenures of the board members, requiring that the minutes of board meetings be sent to the City Commission and the district agreeing to submit all water applications to the city attorney before filing.

The following points of conflict describe the early relationship between the City Commission and the District during the early 1940s.

**District files on Salt Lake City's water rights:**

The first volley was the district filing on 30 to 60 second feet of water rights in Big and Little Cottonwood creeks and all other waters in southeastern Salt Lake County. The City already had long-standing exchange agreements for the same water rights. The district filed Exchange Application numbers 35-46, triggering an outburst of hostilities with the City.<sup>16</sup> The district's applications were published on August 20, 1940 for the purpose of exchanging water which would "spill" from Deer Creek reservoir into Utah Lake in the future, for culinary water from the ditches. The filings caught the City off-guard, as the district had filed them without prior consultation with city officials.



Fisher Harris, Attorney,  
Manager of MWD (1941 -  
1963)

The City was clearly irritated, and was further assailed by the ditch companies, with whom the City had exchange agreements. Under the agreements, the City is obligated to

defend and protect the companies' water rights. Protests signed by Water Commissioner George D. Keyser were filed stating the reasons the applications should be rejected:

- 1) The City has the right to the ditch waters by reason of the previous exchange agreements with the owners and uses the water beneficially for culinary, domestic and municipal purposes.
- 2) The applications fail to provide any water for the protestant (city) in lieu of the water they seek to take, and if the applications are approved Salt Lake City will be deprived of its water rights.
- 3) There is no unused storage capacity in Utah Lake.
- 4) The capacity of the East Jordan canal (which brings water from Utah lake) is fully used and the applications do not make any provisions for purchasing capacity in the canal or to enlarge the canal to permit the conveyance of the water involved.

Several days later the City and district settled the matter. In a joint meeting of the district board and the City Commission at the City & County Building, a resolution was agreed upon whereby Salt Lake City's water rights would be safe guarded in the future by having the district submit proposed filings to the City Attorney and City Engineer to determine whether the City's rights might be jeopardized.

Also, the district agreed to provide the Commission copies of their board meeting minutes; make periodic reports to the Commission and submit all water rights applications to the City Attorney and Engineer for review before filing them with the State Engineer.

The resolution came " in spite of personal utterances from Fisher Harris...maintaining that the commission was unduly alarmed about something that is in fact not adverse to the city's interests at all."<sup>17</sup> This incident may have, at a later date, led the City to support legislation to make the City Attorney and City Engineer the attorney and engineer for the district.



Metropolitan Board  
Chairman Blair Richardson  
(1936 - 1957).

Legislation to allow unincorporated county area into the Metropolitan Water District:

No sooner had the dust settled over the water rights filing issue, than another divisive issue arose at the legislature. The introduction of SB. 150 during the 1941 legislative session provoked still another split between the two bodies. It also revealed the growing independence of the board. The bill would permit the district to accept membership of unincorporated Salt Lake County areas for the purpose of obtaining water from Deer Creek. The district board supported the idea of providing water to the county areas, and from the writings of Fisher Harris, he was sympathetic to the issue.<sup>18</sup>

George D. Keyser vehemently opposed the bill, claiming it was to the City's best interest to protect its preferential rights to Deer Creek water. Keyser described the bill as "vicious," claiming that the Deer Creek water would be paid for by the citizens of Salt Lake City and under the bill there is no way for City taxpayers to prevent a future district board from taking on enough partners that the city would lose control. He further said that any board that controls a water right as valuable as Deer Creek should either be elected by the people of Salt Lake City or subject to removal by the taxpayers' representatives. Mayor Ab Jenkins and the other Commissioners rallied in opposition to the bill and passed a resolution proclaiming that "Salt Lake City's interest is to fully protect its water right."<sup>19</sup>

Blair Richardson, chairman of the Salt Lake City Metropolitan Water District board of directors supported the bill. He publicly attacked Keyser's position on the bill, stating, "He [Keyser] now poses as the guardian of the water supply acquired by the metropolitan water district; but that supply was acquired by the board and not by him."<sup>20</sup>

J. A. Hess, a city resident who testified before a legislative hearing on the matter, expressed the taxpayers' point of view. He asserted that Salt Lake City residents voted a \$10 million mortgage on city property for water which is the "life blood" of the city. He averred "that the city would suffer if rural areas have the advantage of city utilities without the city's bond debt and city taxes." He further proposed that Salt Lake City and County be consolidated and the water district board be abolished claiming that this would really bring about real efficiency.<sup>21</sup>

The bill died.<sup>22</sup> According to the State Engineer's Records in 1999, the exchange applications were rejected.

It's not clear if this breach was fully patched over because both sides had taken strong and opposite positions. It is assumed that this may have caused deep wounds in the relationship.

**Metropolitan Water District asks that Keyser be replaced with the mayor:**

As a result of frequent disagreements with Water Commissioner George D. Keyser, on April 30, 1941, the directors of the district asked that Mayor Ab Jenkins represent the City Commission on the district's board of directors.<sup>23</sup> Citing the need to have more coordination with the City, Chairman Blair Richardson wrote, "it is the intention of the board of directors of the district to seek more frequently your (the Mayor) advice and assistance," claiming that in the past the district's main focus was with obtaining a water supply and conveyance system, but now this had been accomplished. In the future general public policy issues face the district, and the mayor representing the "composite entity" of city government, should represent the Commission on the board.<sup>24</sup>

Despite the board's request to replace Commissioner Keyser, Mayor Ab Jenkins stayed with him, and in June the board was reduced in number and length of term. At that the Mayor said that Commissioner Keyser would continue to serve on the board as head of the city water department. He continued to serve on the board until his term on the Commission ended in 1943.

**State legislation prohibits the hiring of an attorney:**

The 1941 State Legislature passed a special law (SB. 40) that prohibited a district such as the Metropolitan Water District, from hiring an attorney and engineer, requiring the City Attorney and Engineer to do the work for the district. The legislation sponsors claimed the bill would prevent duplication of offices, as the Metropolitan Water District was wholly within Salt Lake City and that legal and engineering work could be under the supervision of the city engineer and legal staff. Fisher Harris was the target of the legislation.

Water Commissioner George D. Keyser urged support of the bill, claiming it would save the taxpayers \$12,000 a year in duplicated salaries.

On May 13, 1941, the effective date of the new law, the district hired Fisher Harris as its defacto manager. This circumvented the legislation. The board had the authority to hire employees, which is allowed under the Metropolitan Water District Act. By a vote of three to one, with one member abstaining, the metropolitan water board of Salt Lake City adopted a resolution designating Fisher Harris, heretofore attorney for the district, as supervisor or manager of the board's activities. The salary was \$500 per month. City Commissioner George D. Keyser voted against Harris' appointment.<sup>25</sup>

**Salt Lake City Commission reduces size of district board:**

The next contentious issue was the size and length of terms of the district board. Two board members, P.J. Purcell and Herbert S. Auerbach, resigned their posts because "they felt it impossible to work with the board as it is now constituted," according to the Mayor who had a conversation with the two. It's not clear whether the two resignations caused the Mayor to look at the board size, or it was the result of the Mayor considering reducing the board size independent of the resignations. But on June 19, 1941, the Salt Lake City Commission repealed the 1935 ordinance creating a water board of seven members and adopted a new one providing for five members and tenures reduced from 6 years to four years. Mayor Ab Jenkins said that the 4-year terms should correspond with the Mayor's term, so that the appointments to the board would coincide with each new mayor.<sup>26</sup> The ordinance gives the power of appointment to the Mayor with the consent of the Commission.

**First test of Salt Lake City's preferential rights to Deer Creek water:**

During the summer of 1941, 400 acre-feet of water was to be released from Deer Creek reservoir. E.O. Larson, chief engineer for the Deer Creek project, needed to drain out part of the already stored 7,000 acre-feet of water to make road repairs and cut trees. Fisher Harris, manager of the district board, said that the district owns the water and favored releasing it for irrigation (to Utah farmers), but felt obliged to offer it first to Salt Lake City. Water Commissioner George D. Keyser first opposed the release, until he found that it was going to be released in order to perform the work necessary to complete the project. Inasmuch as the 400 acre-feet of water probably would be lost in transit to Utah

Lake where Salt Lake City could use it, Keyser agreed it should go to the farmers for irrigation. However, he was not willing to take formal action on the matter. "If we could store the water we surely would keep it, but I don't believe we should go on record as giving it away, since it might set some sort of precedent. We are not in the business of giving it away." The Commissioner's adopted Keyser's recommendation that the commission take no action, and it passed unanimously.<sup>27</sup>

This particular item gives some insight into the relationship between the District and Salt Lake City; the District owns the water, but Salt Lake City has the preferential right to its use. It also gives a glimpse into Commissioner Keyser's staunch demeanor. When asked by Commission John B. Matheson, "Why not go on record as giving the water to the farmers to create good will for Salt Lake City?" Commissioner Keyser shook his head no, tacitly giving it to the Utah County farmers, but not formally acknowledging it by Commission action.

**Keyser disagrees with board on water to military bases:**

The next disagreement occurred in 1942 between the district and Commissioner George D. Keyser over the construction of the Deer Creek Aqueduct (Salt Lake Aqueduct) during W.W. II. The district was pressing for the completion of the project in order serve the military base located near Bacchus, Utah and the Salt Lake Ordinance Plant. The aqueduct was being delayed by the failure to obtain priorities for the necessary steel and rubber. Keyser disagreed with the board, claiming that the emergency wells Salt Lake City drilled during the 1934 drought would allow for enough water to serve the military bases and Salt Lake City. It was Keyser's belief that the 30 cubic feet per second flow from the wells would provide an adequate water supply. In defense of his position, Keyser said, "he was doing his best to help us win this war."<sup>28</sup>

In an action a week later, contradicting Keyser, the City Commission offered its full support to the district in gaining priority in completing the Deer Creek Aqueduct (now Salt Lake Aqueduct) with all commissioners, including Commissioner Keyser voting in favor.<sup>29</sup>

**The end of conflict:**

Perhaps the individuals mellowed, or in the case of Water Commissioner Keyser, left office in 1943, changing the personality of the district board. Or maybe after the early disputes, the District board and the City Commission defined their relationship, allowing both to work together thereafter. Fisher Harris continued as General Manager and Counsel for the District until he resigned on November 4, 1963.

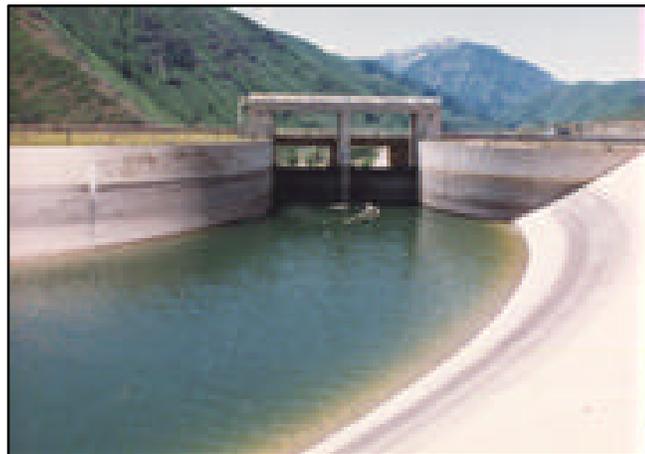
The completion of Deer Creek Reservoir, the diversions, and aqueduct were finished in complete harmony with Salt Lake City. The Little Cottonwood Water Treatment Plant was constructed in the late 1950s. The bond was approved by an 8 to 1 margin. The District sponsored the Little Dell Lake Project in 1986 along with Salt Lake County Flood Control and the US Corp of Engineers. In 1989, the District annexed Sandy City making it a two-city district. The early conflicts have totally disappeared. Contemporary members of both entities cannot recall any acrimonious disagreements over the past 40 years.

#### **METROPOLITAN WATER DISTRICT GAINS ADDITIONAL WATER IN DEER CREEK**

On April 28, 1944 the Metropolitan Water District of Salt Lake City acquired additional 500 shares of stock in the Provo River Project, boosting its total shares to 46,500.

Additionally, in 1958 the Metropolitan District of Salt Lake City entered into an exchange agreement with the Utah Lake Distributing Company to acquire another 15,200 shares of the Provo River Project, bringing the total to 61,700 shares.

When the Provo River Project was developed, the Utah Lake Distributing Company subscribed to 15,200 shares of the 100,000 shares available. In the late 1940s, as part of the project, the Bureau of Reclamation constructed a turbine and pump facility at the Jordan Narrows to deliver the Company's water to the two branch



View of the Deer Creek Dam overflow structure at the right abutment of the dam.

ditches. Water released from the newly constructed Deer Creek Reservoir was delivered to the Narrows through the Provo Reservoir Canal.

In 1952, the Utah Lake Distributing Company acquired the rights of the Company. On December 16, 1952 the Utah Lake Distributing Company, as a means of resuming the use of 70 cfs and an additional 65 cfs under the Company's filings, entered into an agreement with the Associated Canal Companies to pump their junior Utah Lake water rights into the Jordan River through the Utah Lake Pumping Plant, not to exceed 70 cfs.

In an effort to enlarge the water supply, the Utah Lake Distributing Company entered into an agreement with the Metropolitan Water District of Salt Lake City in 1958. The Company would receive up to 135 cfs of irrigation water delivered to its two branch ditches. The District would bear the expense of delivering said water in return for, and in exchange of, the Company's 15,200 shares of Provo River Project water. The District



Deer Creek Lake is a popular recreation area. Thousands use this facility for boating, fishing, wind surfing, and camping. Viewed in 1992.

could pump the specified water from the Jordan River or deliver Provo River Project water through the turbine and pump at the then newly constructed pumping plant up-stream from the Turner Dam. Under the agreement the District would also bear the cost of pumping at the Utah Lake Pumping Plant, constructing a facility at the Narrows with back-up power generating capability and all the costs associated with the 15,200 shares of Provo River Project water.

Under this arrangement, the District acquired an additional 15.2 percent of the Provo River Project, increasing its ownership to 61.7 percent. This increased the M & I supply available to the District.

**SANDY CITY ANNEXED INTO THE METROPOLITAN WATER DISTRICT OF SALT LAKE CITY**

The membership in the Metropolitan Water District changed in 1989, when Sandy City was annexed into the district. On August 14, 1989 the district board of directors voted to adopt Resolution No. 1633, which set forth the terms and conditions for the annexation of Sandy City.

Sandy City had acquired approximately 36 percent of the water rights in Little Cottonwood Creek through exchange agreements. Salt Lake City owned the remainder through exchange agreements. Sandy City was anxious to treat its own water supply and sought membership in the district to utilize the Little Cottonwood Water Treatment Plant located about one-mile downstream of the mouth of the canyon.

Little Dell Reservoir made it possible to annex Sandy City into the district. In 1986, the district had entered into an agreement with the U.S. Corps of Engineers and Salt Lake County Flood Control to build Little Dell Reservoir in Parleys Canyon. The dam and diversions would capture floodwaters from snowmelt, providing on an average year about 7,900 acre-feet of municipal water supply. With the anticipation that the project would be completed in the early 1990s (it was turned over to the sponsors in 1992), Salt Lake City agreed to allow Sandy City to annex into the district.

Resolution No. 1633, and the supporting interlocal agreements, spells out in detail the terms and conditions allowing Sandy City to annex into the District. The key elements of the annexation are:

- 1) Sandy City receives 25 million gallons per day of capacity in the District's Little Cottonwood Water Treatment Plant and aqueduct. In turn Sandy

City paid for the expansion of Salt Lake City's Parleys Water Treatment Plant at a cost of \$6.5 million, and the District paid \$2.5 million towards the cost of construction of three segments of water conveyance pipes so that water deliveries could be made from the Jordan Aqueduct in the northwest quadrant.



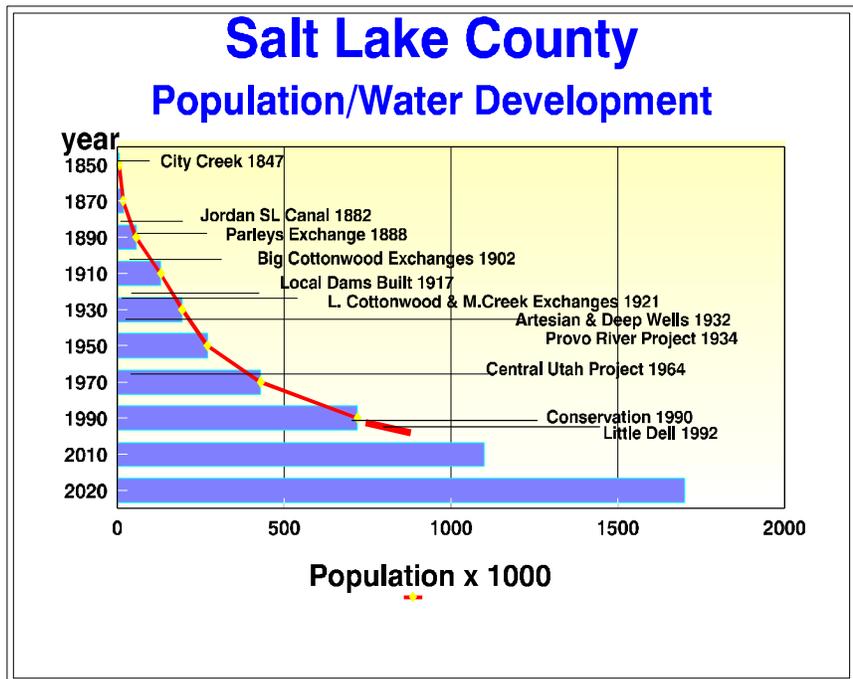
View of the Provo River downstream from Deer Creek Dam after the water passes through the hydropower generators. 1997

- 2) Salt Lake City waived its preferential rights to 7,940 acre-feet of water in incremental amounts between 1990 and 2020. Sandy City preferential right was limited to the same 7,940 acre-feet of water from the water supply of the District, comprising of 61,700 acre-feet of Provo River Project water in Deer Creek Reservoir; approximately 3,100 acre-feet average annual yield of Little Dell Lake Project water in Little Dell Lake Reservoir and 20,000 acre-feet of Bonneville Unit Project water in Jordanelle Reservoir.
- 3) Salt Lake City exchanged 2,000 acre-feet of water rights in two wells for 2,000 acre-feet of District water in Little Dell Lake Project. The District made this water available to Sandy City.
- 4) There were various other terms and conditions that comprised numerous interlocal agreements.

Sandy City's annexation into the Metropolitan Water District of Salt Lake City consolidated the water deliveries of the corporate limits of Salt Lake City, Salt Lake City's county service area southward to Creek Road, and the corporate limits of Sandy City. This area is bound together by the Salt Lake Aqueduct traversing eastern Salt Lake County at the foot of the Wasatch Mountains. In 1998, approximately 425,000 people reside within the two city's water service areas.

## CONCLUSION

To grasp the magnitude of the Water Advisory Board's study and its recommendations, the City's water supply was increased 2-1/2 times over the supply available in 1928; increasing the potential population served from 270,000 to well over 400,000. The formation



**of the Metropolitan Water District of Salt Lake City and subsequent participation in the Provo River Project, provided the City a firm stored water supply outside of the Jordan Basin. In summary, this chart shows the development of water from 1847 to the present time. The chart graphically depicts the relationship between water development and growth in population and the historic quest for new water supplies. Nearly every generation has been asked to build on existing water supplies and conveyance systems to ensure future generations an adequate water supply.**

**The contributions of the 1928 Water Advisory Board, and subsequent actions of the City in following through on the Advisory Board's recommendation has provided the water supply that Salt Lake City enjoys today. The formation of the Metropolitan Water District of Salt Lake City and its pursuit of developing water supplies and conveyance systems has had immeasurable benefits to the citizens of Salt Lake City and Salt Lake County. Its participation in the Provo River Project, Little Dell Project, and subscription to 20,000 acre-feet of Central Utah Project has fulfilled its mission as envisioned in 1935 when it was formed.**

---

<sup>1</sup> Municipal Record, 1928, p.9

<sup>2</sup> City Recorder, Commission Minutes, May 15, 1928, Item 43

<sup>3</sup> Municipal Record, 1928, P.7 "Water Advisory Board Appointed"

<sup>4</sup> Municipal Record, 1935, P2 Excerpts from outline of "Purposes and Effect of a Metropolitan Water District" by Fisher Harris, City Attorney, and Elmer Jacobs, Manager Deer Creek Project Committee

<sup>5</sup> Report to the Metropolitan Water District of Salt Lake City, Utah Upon the Future Water Supply for the City, Alvore, Burdick & Howson Engineers, Chicago Ill. p.11-4

<sup>6</sup> Salt Lake Tribune, August 7, 1937

<sup>7</sup> Salt Lake Tribune, September 17, 1937

<sup>8</sup> Salt Lake Telegram, September 3, 1937

<sup>9</sup> Salt Lake Telegram, November 11, 1937

<sup>10</sup> Salt Lake Tribune, November 6, 1937

<sup>11</sup> Salt Lake Tribune, November 12, 1937

<sup>12</sup> One Hundred years of Water Development, Fisher Harris, p.63

<sup>13</sup> Salt Lake Telegram, October 5, 1937

<sup>14</sup> Municipal Record, 1938, P.2 "Work Started on the Deer Creek Project.

<sup>15</sup> Salt Lake Tribune, September 24, 1940

<sup>16</sup> Salt Lake Tribune, September 24, 1940

<sup>17</sup> Deseret News, September 24, 1940

<sup>18</sup> One Hundred years of Water Development, Fisher Harris, p.117

<sup>19</sup> Salt Lake Tribune, March 12, 1941

<sup>20</sup> Deseret News, February 26, 1941

<sup>21</sup> Deseret News, March 8, 1941

<sup>22</sup> Salt Lake Telegram, March 15, 1941

<sup>23</sup> Salt Lake Tribune, April 30, 1941

<sup>24</sup> Salt Lake Telegram, April 30, 1941

<sup>25</sup> Salt Lake Tribune, May 14, 1941

---

<sup>26</sup> Salt Lake Tribune, June 20, 1941

<sup>27</sup> Salt Lake Tribune, July 18, 1941

<sup>28</sup> Deseret News, May 11, 1942

<sup>29</sup> Salt Lake Telegram, May 19, 1942

## **APPENDIX**

### **REPORT OF THE 1928 WATER ADVISORY BOARD**

#### **Water Supply Investigation**

The report of the Water Supply Advisory Board was made to the Mayor and City Commission. The personnel of this board are H.C. Jessen, City Engineer, Chairman Sylvester Q. Cannon, William Peterson and A. Z. Richards. The report covers the investigation of all possible sources of supply and submits a water development program for the City. The foreword, synopsis, conclusions and recommendations, taken from the report, follow.

#### **Foreword**

The present problem of the City to acquire an adequate water supply for the future, was outlined by the Honorable Mayor John F. Bowman at the first meeting of the Salt Lake City Water Advisory Board.

Briefly stated the problem is to insure the acquisition of a supply, supplementing the present supply, which will provide for the City of the future.

Instructions by the Mayor concurred in by the Board were to provide for a minimum population of four hundred thousand (400,000).

This investigation was handicapped to a certain extent due to the lack of stream flow records or measurements at proposed points of diversion. This was overcome to some extent and acknowledgement is made for correlative data obtained from records of the United States Geological Survey. The United States Reclamation Service, and the Utah Power & Light Company.

#### **Local Sources**

A general study was made to ascertain the feasibility of providing for a population of 400,000 from the local canyon streams, i.e. City Creek, Emigration, Parleys, Mill Creek, Big Cottonwood and Little Cottonwood. The acquisition of additional water from Big and Little Cottonwood through exchanges with the Brown & Sanford, Tanner, Union and Jordan and the Walker Ditches; provisions for storage in all the above mentioned streams and conduit connections, from Little Cottonwood, Mill Creek and Emigration Creek to the City distributing system.

The more desirable phases of the local source possibilities were studied to determine their relative merits considered as separate projects or as adjuncts to the outside projects.

---

## **More Complete Utilization of Present Exchanges**

In the past Salt Lake City has acquired the rights to the major portion of its culinary water thru the medium of exchange with local ditch companies. At the present time, due to limited pump capacity, the City cannot fully utilize various Big Cottonwood and Mill Creek exchanges. The economics of increasing the pumping capacity to fully utilize the exchanges was investigated.

### **Additional Storage in Parleys**

The Mountain Dell Reservoir, located in Parleys Canyon, is the largest and most favorably located as to geological features of the City's reservoirs. Since water supply studies indicate that there is additional water physically available for storage at this site, a study was made to determine the practicability of raising the dam 20 ft. either by building a new gravity or converting the present structure into a round head buttress type dam.

### **Big Cottonwood Storage**

Hydrographic studies of Big Cottonwood to determine water available for storage, also the effect of storage on the various exchange contracts, which the city has entered into, were made. Report of the City Engineer giving costs designs, geology etc. on the Mule Gulch, Argenta, and Mill D Dam sites was carefully studied. Also the design and estimates of cost for an inverted cone type dam for the Argenta site, which were prepared by F.A. Noetzi, Consulting Engineer of Los Angeles. This latter design is to some extent the result of the investigations carried on in connection with the Stevenson Creek test dam.

### **Little Cottonwood**

An analysis was made of the possibilities of obtaining a supply from Little Cottonwood based on the acquisition of the following primary ditches: Tanner, Union & Jordan and the Walker (the Cahoon – Maxfield already acquired), and increasing holdings in Utah Lake to effect these exchanges. This involves moving or purchase of the Murray City Power Plant and constructing conduit to Big Cottonwood. Study was also made including a geologic investigation of the practicability of storage in the Beaver Pond site at the mouth of the canyon.

## **Reservoir Sites in Adjacent Canyons**

In order to establish a basis of comparison of costs with other projects an abstract of possible reservoir sites in the adjacent canyons was made. This abstract contains estimates of cost and capacity for various sites together with the geological features where other than preliminary surveys have been made.

## **“ Outside Sources**

### **Studies made of outside sources of water supply include the following:**

Project No. 1- The supply for this project is the winter and flood stage flow of the upper Duchesne watershed conveyed by means of a tunnel to the upper Provo River, thence flowing westerly to the west side of Pine Valley diverted by means of a conduit to Kamas Valley, siphoned across Kamas Valley and thence by means of a conduit, short siphons and tunnels conveyed to the summit of Parleys Canyon, flowing along Parleys stream bed to the City's distributing system. The storage necessary to satisfactorily

---

utilize this water to be at the proposed Bates reservoir site, exchanging this stored water to the lower users of the Provo River for the natural flow from the Upper Provo.

Project No. 2- Unappropriated water from the upper Green River watershed constitutes the supply for this project. The general plan being the collection of water from the East, Middle and Blacks Forks of the Green river diverted by means of a canal and tunnel to the upper Bear River watershed exchange of this water for an equal amount of Bear river water thence diverted thru canal, tunnels and siphons to the Chalk Creek watershed, stored in the proposed Chalk Creek reservoir. The water released flowing down the Weber River and diverted from the trail race of the Gateway Power Plant by conduit to the City. In addition to the above mentioned supply, water available from Chalk Creek watershed in excess of irrigation, power and Echo storage rights and the Weber winter water in excess of power rights to be utilized. This project involves the treatment of the Weber water, complete filtration and chlorinating being necessary.

Project No. 2-A- The Weber River to furnish the supply for this project with direct storage in the Echo reservoir located at Echo on the Weber River. Diversion to be made from the intake of the Gateway Power Plant at the mouth of the Weber canyon and water conveyed thru a conduit and necessary tunnels and siphons to Capitol Hill, Salt Lake City. The purchase of the Gateway and Riverdale Power Plants from the Utah Power & Light Co. to obtain the right to practically the entire winter flow of the Weber River is involved as well as the acquisition of rights applied for in the Echo reservoir. As in the case of Project No. 2, this water requires treatment.

Project No. 3- The source of supply for this project is also the Weber River storage to be provided in the proposed Larrabee reservoir, located about fifteen miles above Oakley, on the upper Weber River. The water to be diverted from a point approximately seven miles westerly from the reservoir site and delivered to the east side of Kamas Valley thence westerly as in Project No. 1 thru Kamas Valley siphon and thence to the summit of Parleys Canyon by means of conduit, siphons and tunnels to the City distributing system. The water available for diversion from the Weber is considered to be the excess above power rights, irrigation rights down to Echo. Echo storage rights deficiency on Provo River and floodwater filing for Provo River. As the water for city use is to be diverted from the upper Weber River watershed no treatment other than chlorination will be necessary.

Project No. 4- Runoff from the upper Duchesne watershed during period of winter flow and flood stage months constitutes the supply for this project. Storage to be provided in the proposed Bates and American Fork reservoirs. The general plan being to divert water from the upper Duchesne River thru a 5-mile tunnel to the upper Provo River exchanging for a like amount of water taken from the direct flow of the North and South Forks of the Provo conveyed by conduit along the Provo bench joined by a conduit from American Fork Canyon flowing thence northerly along said bench to the Big Cottonwood conduit.

Project No. 4-A- It is assumed in connection with the initial development of this project that the City can secure sufficient capacity in the proposed Deer Creek reservoir, and in the Echo reservoir now being constructed to effect exchanges with the Provo River lower forks, ultimate development to be supplemented by a supply from the upper Duchesne watershed. The plan is to exchange the above water for the natural flow from Deer Creek, North and South Forks of the Provo; also, thru purchase of additional rights in Utah Lake etc. acquiring water from Little Cottonwood Creek completing the direct flow feature of this project. Conduits to be built from the Provo sources adjoining the main conduit from the Deer Creek Reservoir. Through this main conduit the water to be conveyed along the Provo bench to Little Cottonwood continuing to Big Cottonwood and supplemented by lower conduit of smaller size to be used if the Beaver Pond Reservoir site is later acquired.

Project No. 4- B- The operation of this project is based on the use of stored water direct no exchanges the supply to be obtained from the Provo River and Weber River watersheds with storage in the proposed Deer Creek reservoir located on the Provo River southerly from the town of Charleston. Further supply may be added as in Project No. 4-A, by making available the runoff from the upper Duchesne also by means of any storage capacity obtained in the Echo Reservoir. A conduit with necessary tunnels and

---

siphons is to be constructed from Deer Creek reservoir to the mouth of Provo Canyon, thence northerly along the east bench to Big Cottonwood Canyon.

Project No. 5- Water to be obtained from East Canyon watershed through exchange for water from Chalk Creek in excess of demands for irrigation, power and Echo storage supplemented by any rights to storage capacity in Echo obtained. This project involves the construction of the Chalk Creek dam located about six miles east of Coalville on Chalk Creek, a branch of the Weber River to exchange for the East Canyon Dam and reservoir water to be conveyed from the East Canyon Reservoir by means of a thirteen mile tunnel to Emigration Canyon and trench thru a short conduit to the City distributing system.

Project No. 5-A. - In the initial development the supply is to be obtained from East Canyon acquired thru exchange of storage capacity in the Echo and proposed Magpie Reservoir for the East Canyon reservoir involving the construction of a thirteen mile tunnel from East Canyon to Emigration a conduit from Emigration to the Sunnyside reservoir and a canal from the Ogden to the Weber River for the purpose of conveying water from the Magpie Reservoir, located on the south fork of the Ogden River to the lower Weber users. In addition to the above, the ultimate development supply to be the upper Duchesne and Emigration Canyon watersheds. A five mile tunnel from the Duchesne to the Provo diversion from the Provo by conduit tunnel and siphons from a point about one mile above Woodland to the East Canyon watershed and storage in the East Canyon watershed and storage in the East Canyon and the proposed Emigration Reservoirs.

### **Underground Supply**

An investigation was made of the possibilities of obtaining water from underground sources the recovery of losses in the streambeds above and below the mouths of the adjacent canyons as well as water development thru sinking wells in the valley.

### **Conclusions**

In presenting this study and arriving at these conclusions the Advisory Board has endeavored to consider all the various aspects and phase of the problem of a future water supply for Salt Lake City. Estimates and data submitted in relation to details of costs, methods and construction were discussed and approved or revised at the regular meetings held. The various reservoirs sites existing reservoirs, watersheds, streams and proposed conduits important tunnel and siphon locations and various diversion points which were not already familiar to the members as to character and location.

Due consideration has also been given the economic aspects and characteristics involved viz: factors affecting population and probable increase comparative cost per capita, cost per unit of utility, present cost and interest in relation to ultimate cost physical features of supply quality provisions for sanitary patrol and filtration and adequacy of quality, possibility of utilizing excess water, leasing to other users to protect City's acquired rights and a source of possible revenue.

These conclusions concurred in by the members of the Salt Lake City Water Supply Advisory Board follow:

1. To economically provide for a population of 400,000 an outside water supply in addition to the local canyon streams must be acquired.
2. The outside supplies which have been investigated are listed below in the order of their desirability providing the City can secure capacity in Federal Reclamation Projects on the approximate terms assumed, as affected by cost quality of water quantity of water and possibility of future or additional extension.

- 
- a. Project No. 4-B. - 40,000 acre feet capacity in the proposed Deer Creek Reservoir, Provo Canyon-conduit Deer Creek to Salt Lake.
  - b. Project No.2-A. - Weber River winter flow purchase of power plants storage in Echo Reservoir, conduit mouth of Weber Canyon to Salt Lake.
  - c. Project No.5-A. - Acquisition of East Canyon Reservoir and property in exchange for capacity in Echo Reservoir and the proposed Magpie Reservoir. Tunnel East Canyon to Emigration Canyon.
3. The result of the studies made for the purpose of increasing the supply for local sources indicates the following:
- a. Additional pumping capacity to more completely utilize the exchanges is, with two exceptions, excessive in cost and produces only a relatively small quantity of water. This should be considered as an emergency measure only.
  - b. Additional storage in Parleys Canyon at the Mountain Dell site is excessive in cost.
  - c. Acquisition of additional rights in Little Cottonwood and storage in Beaver Pond is complicated owing to the fact that this stream is now involved with innumerable fillings, the determination of which is now in the courts for settlement.
  - d. Storage in Big Cottonwood Canyon at the Argenta site is feasible and the cost is relatively low. The available storage with a 12,000 acre foot reservoir will provide for an increase in population of 80,000.
4. Supply from underground sources is relatively small and uncertain as to continuous flow and should be considered as a supplemental or emergency measure only.

### **Recommendations**

1. That the city purchase 40,000-acre feet of capacity in the proposed Deer Creek reservoir on the Provo River, providing the purchases can be made on the approximate terms assumed in this report.

Terms – Referred to in Projects No. 4-A and 4-B although subject to the actual total construction cost it has been assumed that storage capacity in Deer Creek can be obtained for \$50.00 per acre foot, payable in equal annual installments without interest extended over a period of forty years.

case as above mentioned purchase is merely the initial step in the development of the most desirable of the outside source projects namely Project No. 4-B the advantages are briefly outlined as follows:

As above mentioned purchase is merely the initial step in the development of the most desirable of the outside source projects, namely Project No 4-b the advantages are briefly outlined as follows:

Unit Cost – to reduce cost to a comparative basis it is necessary that a common denominator be used. In of a storage proposition this is best expressed in terms of cost per acre foot, and may further be expressed as cost per capita supported.

Project No. 4-B Cost per acre foot.....	\$211.00
Project No. 4-B Cost per capita.....	\$28.80

These are lowest unit costs of any outside source projects considered.

Quality- the purity, turbidity and sanitary quality of the water will undoubtedly be improved by the effects of storage. By reason of the opportunity given for sedimentation storage tends to settle suspended mineral

---

matter such as clay and silt and thus clarifies the water. Bacteria are reduced in number by natural death due to the destructive action of sunlight so that the sanitary quality of the water is improved. However, as storage offers opportunities for the growth of algae and protozoa if the temperature of the water rises to 65 degrees or 70 degrees F. it is probable that this storage will require some treatment in addition to chlorination during the latter part of the summer.

Quantity and Future Development.- Forty thousand acre feet of storage capacity in the Deer Creek reservoir will furnish an annual yield sufficient to provide for an additional population of 205,000. This project may be enlarged to its ultimate development, by obtaining water divertible from the Upper Duchesne, and also storage capacity which may be obtained in the Echo reservoir as outlined in Project No. 4-A.

Leasing Water Until Needed.- Until the City can fully utilize the supply acquired it will be possible to lease a part or all of the water obtained. This will hold inviolate the rights purchased b providing a means of beneficial use as well as effecting a source of possible revenue.

2. The filings that have been made on the Weber River, for 300-second ft. and for 65-second ft. respectively be maintained in good standing.

The supply from the winter flow of the Weber River covered by these filings is considered as second in desirability of the outside projects, and for this reason is it advisable to provide an alternative in case the City is unable to obtain for any reason storage capacity in Deer Creek on approximately the terms assumed.

3. Favorable action upon and settlement should be urged of the City's application dated January 24, 1927 to the Weber River Water Users Association for from 5,000 to 10,000 acre feet of capacity in Echo Reservoir.

This storage supply is a desirable adjunct, which may be, utilized either as direct storage or exchange storage in connection with the Provo River, Weber River, or East Canyon projects.

4. Construction of a dam without further delay as the Argenta site in Big Cottonwood Canyon to provide for the growth of the city for the next 15 to 25 years.

The Argenta project is considered as being the most desirable of the local sources and presents the following advantages:

Cost - The total cost to provide 12,000-acre ft. reservoir capacity is estimated to be \$2,286,000 for the Inverted Cone Type Arch Dam. As this is approximately one-half the cost of the least expensive outside source project and as a period of from 20 to 25 years is provided for it is evident that under any practical scheme of financing proceeding with the Argenta project would effect a saving in annual outlay.

Unit Cost - based on a dam 230 feet above the stream bed, 12,000 acre feet capacity the

Cost per acre foot is.....	\$191.00
Cost per capita.....	\$28.60

For a 200-foot dam-9476 acre feet capacity	
Cost per acre foot is .....	\$194.00
Cost per capita.....	\$29.00

These units costs are less than any of the outside source projects and also the lowest of local source projects which furnish any appreciable amount of water.

Advantage of Cone Type - The Inverted Cone arch type dam preliminary design submitted by F. a. Noetzli, Consulting Engineer has the following advantages.

---

Relative Cost – The cost is approximately two-thirds that of a gravity type dam, with a possible saving of approximately \$1,000,000.

Factor of Safety - As commonly designed a gravity dam has a factor of safety of only two being subject to uplift and overturning. An arch dam with maximum stresses of 600 lbs. per sq. inch has a factor of safety of at least four at the age of six months. The arch structure would have to be crushed before it could fail.

Design – The Inverted Cone type dam is modified form of arch dam similar to many constant angle arch dams, constructed and in present use. Practical knowledge gained through the construction and testing of the Stevenson Creek Experimental Arch dam as well as certain features which to some extent are similar to those of the dome type used so successfully in the Coolidge Dam have been used in the design of the proposed cone type dam.

Adaptability to Site – Geologic studies of the Argenta site show the presence of two main porphyry dikes. As these dikes intersect the surface of the ground along lines which are curved in an upstream direction it will be feasible to locate an inverted cone type of dam. Including the supporting buttresses between the two dikes so that only one of the wing walls would be intersected by one of the dikes. This would prove to be an advantage as a gravity section would necessarily be intersected by both dikes.

Quality – Big Cottonwood water is recognized as being of excellent quality due to its purity and low temperature. The watershed above the dam site ranges from 7,200 ft. to 11,000 ft. in elevation insuring a supply of cool water even in the summer months. It is estimated that the maximum mean temperature of water stored in the proposed Argenta reservoir would rarely exceed 50 degrees Fahrenheit.

Saving in Pumping Expense – Until such time as the population of the City approaches the limits as fixed by Argenta storage it will not be necessary to operate the Upper Canal pumping plant. However unless the city obtains an additional irrigation supply delivered at a higher elevation than the Utah Lake water it will be necessary in dry years in order to store the capacity of Argenta to pump to the exchanges during the runoff months.

### **Financial Matters**

The amount of water bonds outstanding aggregate \$2,823,700 which represents an annual interest charge in excess of \$125,000. With the proposed new issue the total water bonds would be less than \$6,000,000 and the total annual interest charge about \$250,000 or less than \$2.00 per capita. Exclusive of water rights the total cost of Salt Lake City's water system is \$7,260,302.88.