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PROJECT OR WATERWAY: KANNAH CREEK - REPORT ON WATER SYSTEM EXPANSION

CITY DEPARTMENT: PUBLIC WORKS

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EXPIRATION DATE: NONE

DESTRUCTION DATE: NONE

REPORT ON WATER SYSTEM EXPANSION

GRAND JUNCTION CITY

AUGUST, 1954

By

C. H. Jex, Engineer

Grand Junction, Colorado
August 27, 1954

City Manager W. D. Toyne and
Grand Junction City Council

Grand Junction, Colorado

Gentlemen:

Submitted herewith is a report on water system expansion. The report summarizes my work for the City and recommends Kannah Creek as the source of future water supply.

Supporting information relating to the report is available in loose leaf books. These data will be filed later with the City.

The report points up the need of going forward with a program of securing additional water. The report also suggests that the City undertake a year by year program of replacement of the 23,000 foot section of original pipe of the existing Kannah Creek pipe line.

Yours very truly,

C. H. Jex

PRESENT WATER SYSTEM

The present municipal water supply of the City is obtained from Kannah Creek, a tributary to the Gunnison River. The City's water system has been developed over a period of years, originating with the purchase of 5.04 MGD (million gallons per day) of Kannah Creek water right and the construction of a pipe line from Kannah Creek to the City. The water right is termed "paramount", or a "first" right to the use of the direct flow of Kannah Creek. The water right was acquired in 1911 by Court condemnation of the then existing irrigation water rights of the creek.

Kannah Creek Pipe Line

Water is conveyed to the City by a twenty-mile pipe line. The present line is the result of a number of sectional replacements and enlargements of the original line. The capacity of the line in 1932 was 5.1 MGD; in 1946, it was 6.3 MGD; and at the present time it is 8.5 MGD. Approximately 23,000 feet (4.4 miles) of this line is the original pipe placed in service in 1912.

City Water Rights

To supplement the supply of the original water purchase, the City started acquiring reservoir water in 1928 by the purchase of stock in the Grand Mesa Reservoir Company. In the late 1930's, with Federal assistance, the City constructed the Flowing Park Reservoir; and in 1947 the City constructed the Carson Lake Reservoir. In the 1942 general adjudication of the water rights of Kannah Creek the City acquired an additional direct flow right for 2.52 MGD.

The City direct flow and reservoir water rights are summarized as follows:

Direct Flow:

Right Identification	Decreed Flow
Paramount Right	5.04 MGD - 7.81 cubic feet per second
Priority Number 52	2.52 " 3.91 " " " "
Total Direct Flow	7.56 MGD 11.72 cubic feet per second

Reservoir Storage:

Name of Reservoir or Reservoir Company	Reservoir Capacity
Grand Mesa Reservoir Co.	65 million gallons - 200 acre feet
Flowing Park Reservoir	254 " " 780 " "
Carson Lake	176 " " 540 " "
Total Reservoir Storage	495 million gallons 1,520 acre feet

Population Served

The City water system is now providing water for the following:

Family units within the City,	5,240
Family units outside the City,	1,217
Total family units served water,	6,457

On the basis of 3.29 persons per family unit (Mesa County 1950 average) the City is providing water service for a total population of 21,000 people. Approximately 17,000 of this total reside within the City and 4,000 live outside the City. The Kannah Creek pipe line is only adequate for the population presently served water. City water rights would provide for some small increase in population.

Rate of Water Use

The present average rate of water use is 220 gallons per person per day. This is 80,300 gallons, or about one-fourth acre foot, per person per year. This rate of use includes filter plant process water and water delivered to business houses, city parks, and industrial users under the City system and is averaged on the basis of the population served water. The summer water requirements run as high as 410 gallons per person per day and the winter requirements as low as 120 gallons per person per day. This variation in seasonal use requires not only a regulated water supply, but also a pipe line capacity adequate for the conveyance of water to the City as needed for maximum daily demand. One MGD of pipe line capacity will serve a population of 2,400 to 2,500 people.

The above discussion of water use and pipe line requirement relates only to raw or unfiltered water supply. Prior to use within the City water must be filtered, chlorinated, and again regulated in storage reservoirs of sufficient capacity to supply an hourly demand of approximately double the maximum daily demand. The present filtration plant of the City, with minor adjustments, will handle a flow rate of approximately 13 MGD. This is a reserve capacity of 4.5 MGD over that presently required. The present capacity of the clear water (filtered) reservoirs is twenty-three million gallons. This is about three times the summer daily requirement and is considered adequate for the present system.

FUTURE WATER REQUIREMENTS

The population served water by the City system has increased from about 13,000 in 1934 to 21,000 at the present time. This is an increase of 8,000 in a twenty-year period. The numerical average increase is 400 per year. The average rate of increase over the period 1934-1944 was 200 per year. During the period 1944-1954 the average rate of increase was 600 per year. New residential construction in recent months indicates that the present rate of population growth is in excess of 800 per year. This figure represents the total increase for the City water system and includes expansion both inside and outside the City.

Rural Area Expansion

The future water requirements of the City water system will be somewhat influenced by the policy of the City regarding the sale of water for use outside the City. In the past the City has provided water to limited areas near the City's boundaries. On the basis of continuing this policy, the City may expect water service requests from the residents of a rural area representing a potential expansion of from 3,000 to 5,000 people. This is likely to take place in a six-year period and includes such areas as Clifton, Fruitvale, and West Orchard Mesa.

Water Requirement

Using a rate of population increase of 600 per year and providing an allowance for a population expansion of 3,000 within a six-year period in the rural area outside the City, the following Table represents the probable City water requirement during the next twenty-year period. The large increase in estimate of water requirement for the period 1955-1960 is for rural area expansion.

Future Water Requirement

Year	Total Population	Total Water Requirement Million Gallons	Acre Feet	Pipe Line Requirement-MGD
1954	21,000	1,690	5,180	8.5
1955	21,600	1,730	5,310	8.8
1960	27,600	2,220	6,810	11.2
1965	30,600	2,460	7,540	12.4
1970	33,600	2,700	8,280	13.6
1975	36,600	2,940	9,000	14.8

ALTERNATE SOURCES OF WATER SUPPLY

Water system expansion as needed by the growing population of the City has been accomplished by periodic sectional replacement of pipe of the Kannah Creek line and by securing additional small quantities of water as needed through reservoir construction and the purchase of water. This has been a step by step process requiring a minimum of borrowed money.

The Kannah Creek pipe line is now nearing its ultimate capacity as previously planned. The pipe as replaced over a period of years represents a large investment by the City, and further enlargement of the capacity at this time beyond that previously planned will require the abandonment of long sections of pipe which still has many years of useful service. Ultimate development of the line, as discussed later in this report, will provide for a full utilization of the City Kannah Creek water rights.

Expansion for the use of Kannah Creek water will involve both the purchase of water and the construction of a second pipe line for the conveyance of the water to the City. Further investment in water by the City should, therefore, be directed toward a plan of long range development.

Keeping in mind the requirement of a long range plan of development, a reconnaissance study was first conducted of the potential water resources of the area available to the City. It was determined that the water supply of such streams as Northeast Creek and Whitewater Creek and the Erwin E. Stewart Reservoir water of Rapid Creek on Grand Mesa is

insufficient for City long range development. The three sources of water - Collbran Project, Colorado River, and Kannah Creek - all have adequate resources for the development of a future supply for the City. The advantages, disadvantages, and cost of water to the City by development of each source of supply are discussed individually under separate chapters of this report.

COLORADO RIVER WATER

Water of the Colorado River is relatively hard, containing undesirable concentrations of dissolved solids. These consist primarily of calcium, magnesium, and sodium carbonates and sulfates. Water of the Gunnison River contains even higher concentrations of dissolved solids.

Prior Reports on use of River Water

The use of water from the Colorado River as a source of supply for the City has been considered over a period of years. In 1943 the firm of Black & Veatch, consulting engineers of Kansas City, working for the City recommended the Colorado River as a future source of water supply. The recommended development consisted of the pumping of water from the Grand Valley Project High Line Canal. The plan involved treatment, purification, and storage of water near the Walker Air Field. In 1949 or 1950 the engineering firm of R. J. Tipton and Associates of Denver reported that the use of Colorado River water as a source of supply for the City would be more costly than water obtained from the Collbran Project.

Present Use of Colorado River Water

A number of Colorado River valley towns (Silt, Rifle, DeBeque, and others) are presently using water pumped from the river. The water thus used receives limited treatment, resulting generally in poor quality. Water used at the Bureau of Mines Oil Shale Demonstration Plant near Rifle is also pumped from the Colorado River. In connection with oil shale work the Bureau of Mines has conducted experimental work on the treatment of Colorado River water for domestic use purposes. Detailed

chemical analyses of water and the cost of treatment to produce water of varying degrees of hardness are now available in the files of the office of the Bureau of Mines.

Cost of Water Treatment

An analysis of the data collected by the Bureau of Mines shows that in order to produce water of desirable quality (85 parts per million of dissolved solids), the City could expect a cost of chemicals for water treatment to average about $60.00 per million gallons. Pumping and other operating cost, exclusive of retirement of capital investment, will be $40.00 per million gallons. This cost, stated on an annual basis, is equivalent to $19,700.00 per MGD capacity requirement of the City. At such time as a flow of 9 MGD of water is used by the City, the annual operating cost for water treatment would be $177,300.00. A use of 7 MGD would require an annual expenditure of $137,900.00. Cost of retirement of the necessary capital investment for use of Colorado River water by the City is estimated to run $46,000.00 per year.

The above reported cost attaching to the use of Colorado River water applies only to the water as now available in the river. Each year as additional water is used upstream for irrigation or industrial use within the natural basin or is taken out at the basin the concentration of dissolved solids will increase; and, likewise, the cost of treatment of the river water will increase. A 20 per cent expanded irrigation use occurred in the basin during the past 15-year period. The next 15-year period will, no doubt, show an even greater rate of expansion.

COLLBRAN PROJECT WATER

The Collbran Project plan of development was reported by the Bureau of Reclamation under date of September, 1952. The Project provides for the delivery of 20 second feet (12.9 MGD) of water from Plateau Valley streams to a point near the Walker Air Field. From this point the City, jointly with other potential users, would be required to provide filtration, purification, reservoir storage, and other facilities necessary for the delivery of water to the ultimate users. The new water supply would be adequate for a population of 31,000 people. A period of from five to seven years would be required in the construction of the project.

Repayment Contract

The Collbran Project would be constructed by the Bureau of Reclamation with money appropriated by the Federal government. The cost of construction would be repaid by the users of water.

The usual plan of contracting for the repayment of Reclamation projects is for the Government to require a joint obligation contract covering at least the cost of a specific water use feature. As a participant in the Collbran Project, the City would be required to contract jointly with others for the repayment of the cost of the domestic water feature of the Project. The cost would be repaid to the Government in equal annual installments over a fifty-year period, with interest.

Cost of Development

The capital cost to be contracted for repayment by all domestic water users would be the actual cost of construction as allocated to the domestic water feature. This is estimated to be $3,603,000.00 at 1952 construction prices. To retire this cost with interest at 2.6 per cent over a fifty-year period, the annual installment would be $129,530.00. This annual water charge is over and above the operation and maintenance cost of the Project. The annual operation and maintenance cost of the domestic water feature has been estimated to be $8,500.00.

City Obligation

It is anticipated that the City would be required to contract for a minimum obligation to use and repay the water charges attaching to 9 MGD. This is 69.7 per cent of the water yield of the domestic water feature of the Project. The annual installment required of the City to retire the capital cost of water delivered to it at the Walker Air Field is $90,400.00 for 9 MGD, or $10,040.00 per MGD. This annual cost would continue for a fifty-year period.

Development of the Collbran Project would provide Grand Junction City and the Valley area with a domestic and municipal water supply for a long period of years. City participation in the Project at this time would probably assure early construction. Without City participation the Project as now planned could not be constructed. Should the City not participate in the Project, the irrigation in Plateau Valley as provided by the Project could be developed by a modification of the present plan of development.

The run-off of Kannah Creek is fully appropriated during years of less than average precipitation. The development of a future supply of water for the City by the use of the unappropriated flow of the stream would thus be dependent upon the capture of large amounts of water during high run-off years by reservoir storage in order that the same could be held over for use in low run-off years. The construction of reservoir storage in the Kannah Creek basin in the amount necessary for the carry-over of water would be more costly than the purchase of existing water rights and facilities of that area.

Kannah Creek Pipe Line

A study of the hydraulic properties of the present Kannah Creek pipe line shows that at such time as it becomes necessary to replace 23,000 feet of pipe, the water conveyance capacity of the line could be increased from the present capacity of 8.5 MGD to about 9.3 MGD. This section of line is the only remaining pipe of the original line constructed in 1912.

Replacements of the original line have consisted in the laying of 18 and 20-inch cast iron pipe and steel pipe with protective coating. After full replacement as now anticipated, the line should have a life expectancy of at least equal to or greater than the life of the original line.

Over the past ten to fifteen-year period, leaks have occurred in the 23,000 foot section of line. At the present time the repair of leaks is accomplished at a very nominal cost to the City. There is some

question as to how long the City may expect economical use of this 23,000-foot section of line. After study of the problem and advice of pipe manufacturers, it appears reasonable to expect that with year by year replacement of the more deteriorated sections full replacement may with reasonable safety be spread over a period of ten to twelve years.

Water Yield of City Kannah Creek Water Rights

The firm water yield of the City Kannah Creek rights is only sufficient to support the present pipe line developed to a capacity of 9.3 MGD. Expanded use of Kannah Creek water by the City will require the purchase of additional water and the construction of a second pipe line to deliver the water to the City

The winter water yield of the City Kannah Creek paramount right is not presently fully used. This winter excess will provide for the winter water requirements of the City for approximately double the present population, or with adequate regulation it could be made to serve an increase in population of about 4,000 people.

Plan of Development

The most economic plan for development of a water supply from Kannah Creek is for the City to purchase water rights and storage facilities from the irrigation interests of the basin and construct a new pipe line for the conveyance of the water to the present City Filtration Plant. Preliminary study of pipe line cost indicates that a line with a capacity of 7 MGD would be the most economic for long range development. The new line would have a total length of 83,000 feet.

Seven MGD of new pipe line capacity added to the ultimate capacity of the present line of 9.3 MGD would provide the City with a total pipe line capacity of 16.3 MGD. A total population of about 40,000 could be provided water by the two pipe lines. This is a population increase of 19,000 over that presently served. Seventeen thousand of this increase would be provided water service by the new 7 MGD line and two thousand by the enlargement of the present pipe line from 8.5 MGD to the ultimate capacity of 9.3 MGD. The two pipe lines would provide a measure of operational safety and would assist in the solution of maintenance problems of the two lines.

The winter water requirement for the increase in population served by the new 7 MGD pipe line could be supplied from the unused water of the City "paramount" right. A purchase of 2,600 acre feet (847 million gallons) of firm regulated water would provide for the summer water requirements. It is recommended that about 2,000 acre feet of water be purchased at the time the new pipe line is constructed, and the purchase of the balance be deferred until such time as the water yield of the newly acquired water rights could be established.

Cost of Kannah Creek Water

Owners of irrigation water rights of the Kannah Creek Basin have signified a willingness to sell certain water rights and facilities to the City. The estimated capital cost of a Kannah Creek development for a pipe line capacity of 7 MGD and the purchase of 2000 acre feet of water, as discussed above, is $1,600,000.00. The annual payment to retire this capital cost in 30 years at 3 per cent interest is $81,600.00. The annual cost per MGD is $11,700.00.

The annual operation and maintenance cost of a Kannah Creek development would be about the same as the estimated operation and maintenance cost of the domestic water feature of the Collbran Project.

SUMMARY AND CONCLUSION

Water from Kannah Creek or the Collbran Project would require a relatively large capital expenditure with a low annual operating cost. On the other hand, the use of Colorado River water would require a relatively small capital expenditure with a high annual cost of water treatment.

An estimate of the approximate annual cost of water to the City for a 22-year period from the Colorado River, Collbran Project, and the Kannah Creek source of supply is summarized in the following table. The figures include retirement of capital investment, operation and maintenance, treatment of Colorado River water, and filtration of water. The retirement of capital investment is based on a 30-year period at 3 per cent interest. The figures cover a developed supply of 9 MGD from the Collbran Project and a new developed supply of 7 MGD from Kannah Creek.

Year	Population Served		Annual Cost		
	Total	New	Colorado River	Collbran Project	Kannah Creek
1954	21,000	-	$ -	$ -	$ -
1956	22,200	1,200	56,000.	-	88,000.
1958	23,400	2,400	66,000.	-	88,000.
1960	27,600	6,600	98,000.	137,000.	88,000.
1962	28,800	7,800	109,000.	137,000.	88,000.
1964	30,000	9,000	117,000.	137,000.	88,000.
1966	31,200	10,200	127,000.	137,000.	88,000.
1968	32,400	11,400	137,000.	137,000.	88,000.
1970	33,600	12,600	161,000.	152,000.	103,000.
1972	34,800	13,800	171,000.	152,000.	103,000.
1974	36,000	15,000	181,000.	152,000.	103,000.
1976	37,200	16,200	191,000.	152,000.	103,000.

As a result of my study of the several sources of water supply available to the City, giving due consideration to annual cost of retirement of capital investment, the cost of treatment of Colorado River water, and the utilization of present water facilities of the City, the following conclusions are given:

1. Conditional upon the purchase of certain Kannah Creek water rights and facilities at prices and on terms required by the City, a Kannah Creek development of a capacity of 7 MGD as discussed above is the most attractive plan of water system expansion for the City.

2. Should the City be unable to purchase the water rights and facilities desired at prices and on the terms required, the Collbran Project should be considered as a source of water supply for City water system expansion.

3. Any plan of Kannah Creek water development by the City would require the purchase of presently existing water rights and the abandonment of land from irrigation.

4. The purchase of certain Kannah Creek water rights and facilities and the construction of a 7 MGD capacity pipe line would enable the City to provide water for a total population of about 40,000 people. This figure includes the 21,000 now served. If in the future it becomes necessary to use the entire firm water supply of Kannah Creek for domestic purposes, an additional 15,000 to 20,000 people could be provided water.

(EVENING REGIONAL NEWS ROUNDUP)

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(RADIATION)

A UNIVERSITY OF COLORADO DOCTOR SAYS THAT A COMPARATIVELY HIGH INCIDENCE RATE OF CANCER AND BIRTH DEFECTS IN GRAND JUNCTION, COLORADO, MAY BE CAUSED BY RADIATION FROM URANIUM-TAINTED LANDFILL IN THE AREA.

DR. C-HENRY KEMPE MADE THE STATEMENT IN PREPARATION FOR A CONGRESSIONAL SUBCOMMITTEE HEARING IN WASHINGTON FRIDAY. KEMPE REPRESENTS A COLORADO HEALTH DEPARTMENT ADVISORY COMMITTEE FORMED TO DETERMINE EFFECTS OF THE RADIOACTIVITY.

KEMPE SAYS A REVIEW OF DEATH CERTIFICATES FROM 1965 THROUGH 1968 SHOWS DEATHS FROM BIRTH DEFECTS...IN HIS WORDS..."ARE MORE THAN 50 PER CENT HIGHER IN MESA COUNTY THAN IN COLORADO FOR THE (SAME) FOUR-YEAR PERIOD."

KEMPE SAYS MESA COUNTY HAD 153 CANCER DEATHS WHILE THE REST OF COLORADO HAD 123.

URANIUM MINE TAILINGS WERE USED IN LANDFILL AND MORTAR FOR THE CONSTRUCTION OF MANY WESTERN SLOPE BUILDINGS. THE MATERIAL EMITS A RADIOACTIVE RADON GAS WHICH IS CAPABLE OF PENETRATING FOUNDATIONS.