



DEPARTMENT OF  
PUBLIC WORKS

CITY OF SACRAMENTO  
CALIFORNIA

1391-35TH AVENUE  
SACRAMENTO, CA  
95822-2911

WATER DIVISION

916-449-5271

February 17, 1987

Joint Budget and Finance/Transportation and  
Community Development Committees  
Sacramento, California

Honorable Members in Session:

SUBJECT: EXPANSION OF WATER TREATMENT FACILITIES

SUMMARY

A study was recently completed by Brown and Caldwell Consulting Engineers on the expansion of the City's water treatment facilities. Based on this study, staff recommends that the Sacramento River Water Treatment Plant be modified to extend its capacity from 105 million gallons per day (MGD) to 135 MGD and the American River Water Treatment Plant expanded from 100 to 200 MGD. It is further recommended that \$2,000,000 be transferred to begin the modifications at the Sacramento River facility.

BACKGROUND

As the City has grown during the past years, its demand for a safe and dependable water supply has increased. Additionally, a significant rate of growth is projected for the City in future years. With these additional treated water requirements our existing facilities are rapidly approaching their safe maximum output. Necessary additional capacity can be obtained by expanding the American River and Sacramento River water treatment facilities.

It was toward this projected expansion that the firm of Brown and Caldwell, Consulting Engineers, was retained to study and identify the methods and costs associated with increasing water treatment plant capacity. The recently completed report by Brown and Caldwell (summary of findings and recommendations are attached as Exhibit 2) recommends the immediate expansion of the Sacramento River Water Treatment facility to 135 MGD with a scheduled completion by June of 1989. In addition, the report suggests expansion of the American River Water Treatment Plant to either 150 MGD or 200 MGD.

The selection between these alternatives would be based on the City's consideration of many factors including economics, water demand growth, environmental and construction impacts, water supply reliability, and the desire for a new treatment plant on the Sacramento River.

The Public Works Department staff has discussed plant expansion at length and considered the data and factors presented in the Brown and Caldwell report. To provide an adequate water supply to its citizens through the year 2000, it is staff's recommendation that the City do the following:

1. Modify the Sacramento River Water Treatment Plant to treat 135 MGD by 1989.
2. Expand the American River Water Treatment Plant to 200 MGD by 1990.

Moderate expansion of the Sacramento River facility, at an estimated cost of \$4,000,000, will provide relatively inexpensive unit (per MGD) capacity. In addition, the proximity of the Sacramento facility to the Natomas area is another positive point. This facility will continue to provide and expand its treated surface water service to the Natomas area until a decision can be made on a new treatment facility upstream on the Sacramento River. Moreover, expansion of the Sacramento River Water Treatment Plant will move the City closer to perfecting its Sacramento River water rights which allow a maximum diversion of 145 MGD. The increase to 135 MGD will demonstrate to the State of California's Water Resources Control Board that the City is, in a timely fashion, moving closer to utilizing all of its Sacramento River rights.

Expansion of the American River to 200 MGD is recommended based not only on the City's projected needs but also on the probable agreement to provide wholesale service to other interested water purveyors. In addition, the City will move closer to utilizing more of its contracted American River water entitlements. Estimated costs associated with the expansion of the American River facility are \$43,000,000.

In addition to the plant expansion costs estimated at \$43,000,000 it will be necessary to expand our distribution system and storage facilities in order to serve areas of new growth or service. The estimated costs associated with the distribution system expansion program are \$60,000,000, an equitable portion of which will be paid for by outside agencies to which treated water will be provided.

In order to meet the near future water needs of our rapidly growing community in a timely manner, the expansion of both facilities should be completed by 1990. This expansion schedule is ambitious but we are optimistic that it is achievable. A projected timetable for plant expansion is attached to this report as Exhibit 1.


FINANCIAL

The current Capital Improvement Budget contains \$2,000,000 for environmental review and design for plant expansion. Staff recommends that these current funds be directed to the American River Plant project to begin its environmental review and design. Additionally it is recommended that the current Capital Improvement budget be increased by \$2,000,000 to cover the environmental review, design, and initial construction costs of a modification to the Sacramento River plant. Funds to complete the construction will be included in the 1987-88 Capital Improvement Budget.


RECOMMENDATION

It is recommended that the attached Resolution transferring \$2,000,000 from the Water Fund for Sacramento River Plant Modifications be approved. It is further recommended that staff be instructed to initiate discussions with those water agencies within the City's water rights place of use who may be interested in purchasing treated water.


Respectfully submitted,

  
JAMES G. SEQUEIRA  
Acting Division Manager

RECOMMENDATION APPROVED:

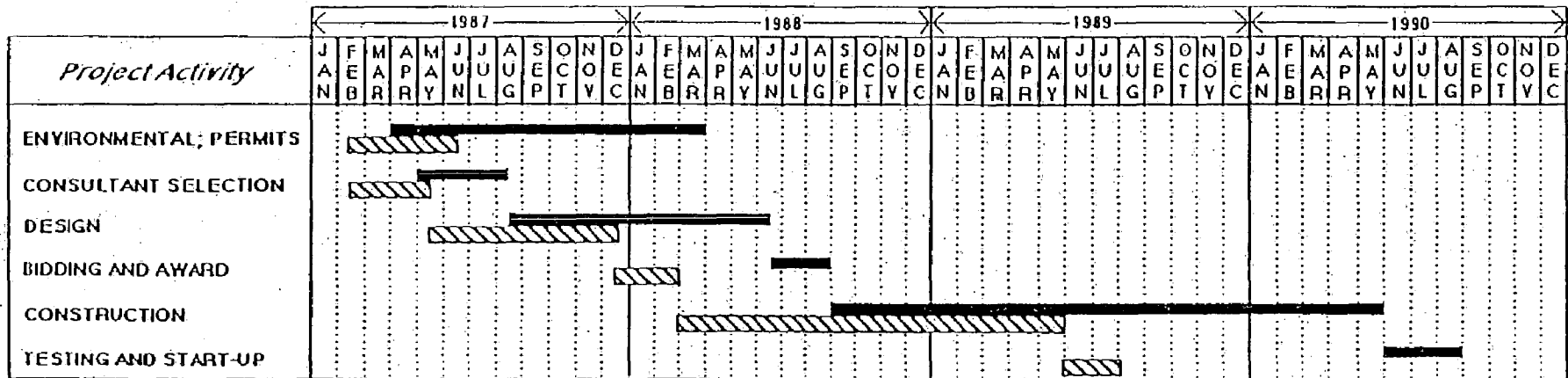
  
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SOLON WISHAM, JR.  
Assistant City Manager

APPROVED:



  
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MELVIN H. JOHNSON  
Director of Public Works

February 17, 1987  
ALL DISTRICTS

w/Attachments



**WATER TREATMENT PLANT  
EXPANSION PROJECT  
IMPLEMENTATION SCHEDULE**

Key: American River Plant   
 Sacramento River Plant 

**EXHIBIT 1**

**RESOLUTION No.**

**Adopted by The Sacramento City Council on date of**

**RESOLUTION AMENDING THE 1986-87 WATER DIVISION BUDGET  
FOR DESIGN AND CONSTRUCTION OF MODIFICATIONS OF THE  
SACRAMENTO RIVER WATER TREATMENT PLANT AND TRANSFERRING  
\$2,000,000 FROM THE WATER FUND CONTINGENCY RESERVE**

**BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SACRAMENTO:**

1. That the design and construction of modifications to the Sacramento River Water Treatment Plant be added to the list of capital improvement projects.
2. That the 1986-87 budget be amended by transferring \$2,000,000 from the Water Fund Contingency Reserve (4-13-710-7012-4999) to the Capital Improvement Budget (4-13-500-xxxx-4820) for purposes of beginning design and construction of the modifications to the Sacramento River Water Treatment Plant.

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MAYOR

ATTEST:

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DEPUTY CITY CLERK



CITY OF SACRAMENTO  
DEPARTMENT OF PUBLIC WORKS

**WATER TREATMENT PLANT  
EXPANSION STUDY**

DECEMBER 1986

 **BROWN AND CALDWELL**  
**CONSULTING ENGINEERS**

In Association with



**DEWANTE AND STOWELL**  
**CONSULTING ENGINEERS**

## CHAPTER 1

### SUMMARY

This chapter provides an overview of this engineering investigation of expansion of the City of Sacramento's (City) water treatment system. An explanation of the scope and conduct of the work is followed by a summary of our findings regarding the best ways to expand the water supply system to meet future needs.

#### Scope of Project

Water demand within the City of Sacramento service area has grown steadily and is approaching the water supply capability of the system. The City has determined that additional water supply capacity should be obtained from expansion of the Sacramento River Water Treatment Plant (SRWTP) and the American River Water Treatment Plant (ARWTP). The purpose of this study is to determine the best ways to expand water production capacity at these two plants considering economics, feasibility, useful lives, and environmental impacts. The City will combine this information with other information and decide on a specific implementation program.

This investigation focuses on the high priority issues relating to expansion of the City's water treatment system to meet the growth in water demand expected to occur during the coming decades. No precise study period is defined because it was deemed important to investigate all expansion alternatives that can provide logical and economical increments of supply, regardless of their exact relationship to the City's long-term water demand projection. For example, one modular expansion element might meet growing water demands for a decade or more, while another simple, attractive improvement might meet only a few years' demand increase. Both might have important roles in the City's overall expansion program.

Near the end of this report (in Chapter 8), a section on project implementation defines the time required to effect each plant expansion, as well as the cost and merits of each. This information can be integrated with the myriad of other planning and fiscal inputs to arrive at a specific program for water supply expansion. Intentionally, that last step is not taken in this report.

The City's surface water supply (from Sacramento and American Rivers) is supplemented by groundwater from wells. The wells help meet peak summer demands and fire flows, and thus relieve peak demands on the treatment plants. This study does not analyze the economics or hydraulics of the groundwater supply (or the water which can be supplied through the Sacramento River subsurface collectors

which is treated at the Riverside Treatment Plant) nor does it address the question of the future role of these supplies, but assumes that all future demand on the City system must be met through the two major treatment plants. Similarly, the important and complex issues of treated water storage and transmission facilities are not covered in this work. Planning and design of these facilities are influenced by many more factors than those considered here.

### Water Treatment Requirements

The City is truly blessed with an abundant supply of low cost, high-quality water. This is a legacy that the community is well aware of, and which it enjoys and appreciates. The City leaders and water managers have long conducted their water planning and operations to fully utilize this valuable resource. These objectives continue:

1. Provide treatment and distribution systems to make full beneficial use of the water resource and protect the City's water rights against any claim of disuse.
2. Treat the water to continuously meet all applicable drinking water standards.
3. Study potential treatment improvements and anticipate evolving water quality standards.

This project is designed to further these objectives. Currently applicable water quality standards and probable future standards are discussed and then applied to the development of the expansion program.

### Summary of Findings

City water supply planning should be based on the use of treated surface water only; the other existing sources of supply (groundwater wells and the Sacramento River subsurface collectors) provide an interim margin of reliability and safety. The supply system should furnish the expected maximum daily water use plus a margin of about 10 percent for reliability and to meet extraordinary or unexpected demands. On this basis, the supply capability should be 250 million gallons per day (mgd) in 1991, and will need to increase to 400 mgd in the year 2010. The expected growth in demand is nearly linear between these two points. These demand figures include anticipated service to McClellan Air Force Base, Arcade Water District, and portions of unincorporated Sacramento County beginning in about 3 years.

Currently, the maximum day capacity and water rights at the Sacramento River Water Treatment Plant (SRWTP) and the American River Water Treatment Plant (ARWTP) are as follows:

	<u>SRWTP</u>	<u>ARWTP</u>	<u>Total</u>
Plant capacity, mgd	105	100	205
Water rights, mgd	145	436	581

It is clear that (1) additional treatment capacity will be needed as soon as it can be brought on-line (about 2 1/2 years minimum), and (2) there is ample untreated water supply available to meet anticipated needs for more than 3 decades into the future.

Both existing water treatment plants consistently produce a high quality treated water that meets all current and proposed drinking water standards. The number of drinking water standards, and the stringency of these standards imposed on water utilities by federal and state law is increasing rapidly as a result of the 1986 federal Safe Drinking Water Act Amendments. Prospective standards are discussed in Chapter 4, and are compared with current standards, and with the City's drinking water sources.

For Sacramento River water, complete conventional treatment (coagulation, flocculation, sedimentation, and filtration) is needed year-round to maintain consistently low finished water turbidity. There are few water quality concerns with this water; the noteworthy ones are:

1. Trihalomethanes (THMs), produced by chlorination of (mainly) natural precursor organic compounds, remain below the present standard, but THM standards may be lowered in the future and may not be easy to meet. Certain disinfection modifications should be tried on a pilot scale, and might provide a relatively low cost solution. If not, more expensive measures (such as ozonation or activated carbon filters) may be needed in the future, and can be added as required.
2. Agricultural chemical contamination occurs seasonally, causing occasional taste and odor nuisance and raising public concern of more serious health risks. Presently, the rice field herbicides molinate ("Ordram"), thiobencarb ("Bolero"), and bentazon ("Basagran") are occasionally present in troublesome concentrations; other chemicals will appear in the future. In the short term, chemical measures (permanganate oxidation and powdered activated carbon adsorption) will provide adequate protection. However, the appropriate long-term solution to chemical contamination lies in the regulatory approach of (1) setting appropriate maximum contaminant limits, (2) controlling chemical sales and application practices, and (3) adequate monitoring and enforcement. Because of heightened public concern and the responsible action being taken by the Regional Water Quality

Control Board, the outlook for effective regulatory control of these chemical contaminants is now more confident than in recent years.

American River water is of excellent quality and can be adequately treated by direct filtration (i.e., without the sedimentation step) during the entire high demand season. Full conventional treatment should be provided for use during the storm season when river water turbidity rises. During occasional low flows in the American River, algal growths cause musty taste and odor conditions. This infrequent occurrence can be controlled by powdered activated carbon feed.

THM levels in chlorinated American River water are similar to those in Sacramento River water, and the earlier THM comments apply. Trichloroethylene (TCE) in the American River has been of concern because the TCE level has reached the proposed TCE contaminant limit when the river flow was reduced temporarily for planned federal maintenance projects. In 1986, the TCE flow into the river appears to be reduced. This is probably a combination result of the Aerojet cleanup program, and continued flushing of contaminants into the river by groundwater flows. In any event, we believe that TCE in the American River will continue to diminish and will not pose a health threat. Obviously, continued diligence and monitoring is justified to identify any other potentially serious contaminants in the river.

After defining raw water and treated water characteristics, and appropriate treatment processes, several expansion alternatives were considered for the SRWTP and the ARWTP. In each case, the expansion projects ranged in capacity up to the water rights limitations; 145 mgd and 436 mgd, respectively.

Detailed investigations of SRWTP expansion were for (a) expansion to 135-mgd capacity without major structural modifications, and (b) expansion to 145-mgd capacity through construction of a new preliminary treatment train. The smaller expansion (135 mgd) is an easier, faster, and lower cost project which substantially meets project objectives, and is the recommended alternative.

Orderly expansion of the ARWTP to a total capacity of 440 mgd is feasible and a plan for this long-term expansion program is presented in Chapter 7. This study is more concerned with providing a basis for selecting the best short-term expansion projects. For ARWTP, a detailed comparison is made between (a) expansion to a capacity of 150 mgd utilizing the existing river intake and preliminary facilities, and (b) expansion to 200 mgd, including river intake enlargement and parallel process units. New grit basins, backwash water reclamation, filters, piping, and appurtenant facilities are needed in both cases.

A summary of capital costs, unit costs of treatment, and project implementation time is given in the following table:

<u>Alternative</u>	<u>Capital cost, dollars<sup>a</sup></u>			<u>Earliest project completion date</u>
	<u>Total project cost</u>	<u>Unit cost per mgd of expansion</u>	<u>Unit cost of treatment, dollars per mg</u>	
SRWTP				
Expansion to 135 mgd	5,690,000 <sup>b</sup>	189,000	145	June 1989
ARWTP				
Expansion to 150 mgd	15,100,000	302,000	151	February 1990
Expansion to 200 mgd	34,100,000	341,000	169	June 1991

<sup>a</sup>July 1988 price level.

<sup>b</sup>Includes \$1,391,000 for construction of new intake screens which may not be required.

The important assumptions and explanations of these figures are discussed in Chapter 8 and need to be understood to judge the relative merits of each project. Expansion of ARWTP to 150 mgd and thence to 200 mgd, as two construction phases, is also discussed.

We believe that expansion of the SRWTP to 135 mgd is an important part of the City's water supply program, regardless of exactly how the ARWTP is expanded. Expansion of SRWTP should proceed immediately and be completed in June 1989. A decision regarding expansion of the ARWTP requires further consideration by the City of factors including (1) economics, (2) water demand growth, (3) environmental and construction impacts, (4) water supply system adequacy and reliability, and (5) the outlook regarding future construction of a new treatment plant on the Sacramento River in the North Natomas area. Information provided in this report will be combined with other community planning factors in making the final implementation decisions.

### Summary of Recommendations

The primary intent of this report is to provide information to guide the City in the planning and scheduling of water treatment facilities in conjunction with other planning considerations. Therefore, recommendations as to a specific improvement program have not been made. However, during the course of the study, and as indicated throughout the report, a number of specific recommendations as to certain elements of the overall program were developed and are repeated here in summary form as follows:

1. The SWRTP should be expanded to 135 mgd at an early date.
2. If the ARWTP is expanded to 200 mgd capacity, a new intake in the American River should be part of the improvement plan.
3. Consideration should be given to acquiring a site for a major new treatment plant on the Sacramento River in the North Natomas area.
4. Tri-media should be used in any new filters added to the ARWTP, and the new filters should be provided with a filter-to-waste feature to minimize turbidity spikes after backwashing.
5. Chlorine should continue to be used as the major disinfectant at both treatment plants unless there is an increased THM level, more stringent THM standards are imposed, or there is reason for increased concern over the safety of handling chlorine.
6. Potassium permanganate feed facilities should be maintained at SRWTP and should be added at ARWTP.
7. Increased monitoring for raw water contamination should be undertaken at both treatment plants.
8. Laboratory investigations and pilot and full-scale studies should be continued to develop better control strategies for organic contaminants and to assess the performance of various treatment modifications.