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DEPARTMENT OF
PUBLIC WORKS

CITY OF SACRAMENTO
CALIFORNIA

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February 2, 1988

Budget and Finance/
Transportation and Community Development Committee
Sacramento, California

MELVIN H. JOHNSON
DIRECTOR
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Honorable Members in Session:

SUBJECT: CURRENT AND PROJECTED WATER SYSTEM REQUIREMENTS

SUMMARY

In the fall of 1987, the City Council directed staff to report on the condition of the City's infrastructure, identify deficiencies, and outline plans to meet future growth. The first of these reports, discussing the water system, is now presented for your review. As the report indicates, the City's water system is in good condition, our water rights are sufficient to insure a dependable water supply for the foreseeable future, and expansion of the two major water treatment plants is the first step toward meeting future demand. Debt financing will be necessary for the initial system expansion, but thereafter, annual revenue from rates and water development fees should be sufficient to cover growth induced expansion.

RECOMMENDATION

This report is submitted for Committee information.

Respectfully submitted,

Melvin H. Johnson
MELVIN H. JOHNSON
Director of Public Works

APPROVED FOR COMMITTEE INFORMATION:

Solon Wisham Jr.
SOLON WISHAM, JR.
Assistant City Manager

February 2, 1988
ALL DISTRICTS

CITY OF SACRAMENTO
OVERVIEW OF CURRENT AND
PROJECTED WATER SYSTEM REQUIREMENTS

PREPARED BY

DEPARTMENT OF PUBLIC WORKS

WATER DIVISION

JANUARY, 1988

SUMMARY

The City of Sacramento has an abundant, high quality water supply. The facilities that test, treat, pump, store and distribute water are generally in good condition and the City can continue to maintain and replace these facilities as needed without significant changes in the rate structure. The City's water rights for diverting water from both the Sacramento and American Rivers are sufficient to assure a year round supply of high quality surface water. Future growth projected throughout the City, and particularly in areas of intense development such as North Natomas would have a major impact on water demand and system planning. Expansion of the City's two major water treatment plants is the first step in meeting future demand. Additional storage, transmission mains and other associated facilities will also be needed. Debt financing will be necessary for funding the initial system expansion between 1988-1991. Subsequently, annual revenue from water rates and the water development fee should meet the need for further growth induced expansion.

INTRODUCTION

The City of Sacramento is truly fortunate with regard to its water resources. The Sacramento and American Rivers, which flow through the City, are among the largest rivers in the state. The water they supply is reliable in quantity and of exceptional quality.

The City of Sacramento developed the first municipally-owned surface water system in California in 1849. Through the years, the City system has been continuously expanded and upgraded to keep pace with growth and the newest developments in water supply technology. The existing City service area covers about 104 square miles and is bounded approximately by the present City limits shown on Figure 1. The present system consists of two surface water treatment plants, two ground water treatment facilities, nine distribution storage reservoirs, four major pump stations, 68 wells, and nearly 1,500 miles of mains.

WATER SUPPLY

Surface Water Supply

Between 1849 and 1964, the City relied upon the Sacramento River as its primary source of water supply. From 1849 until 1916, Sacramento River water was delivered untreated to the community. In 1916, chlorination was added which greatly reduced the incidence of water-borne diseases, such as typhoid and cholera. The initial treatment plant was constructed in 1924 with an original rated capacity of 32 million gallons per day (MGD). Subsequent improvements and changes in operating procedures have raised the peak capacity of the original works to about 90 MGD.

In 1964, the first stage construction of the Fairbairn Water Treatment Plant, located on the south bank of the American River, was completed. The plant's initial capacity of 70 MGD has been expanded to 100 MGD as a result of modifications and improvements.

Groundwater

Within the City's water supply area, groundwater supplies are relatively abundant and of generally high quality. However, a gradual decline in the water table has occurred at some city wells. This depletion of the groundwater aquifer has been observed in several other areas of Sacramento County as well.

The City currently maintains 68 wells with a total estimated capacity of 70 million gallons per day which provide municipal and industrial supplies. The majority of the wells are located north of the American River and represent the sole source of supply for the northern service area, with the exception of the Campus Commons, South Natomas, and North Sacramento areas (See Figure 1).

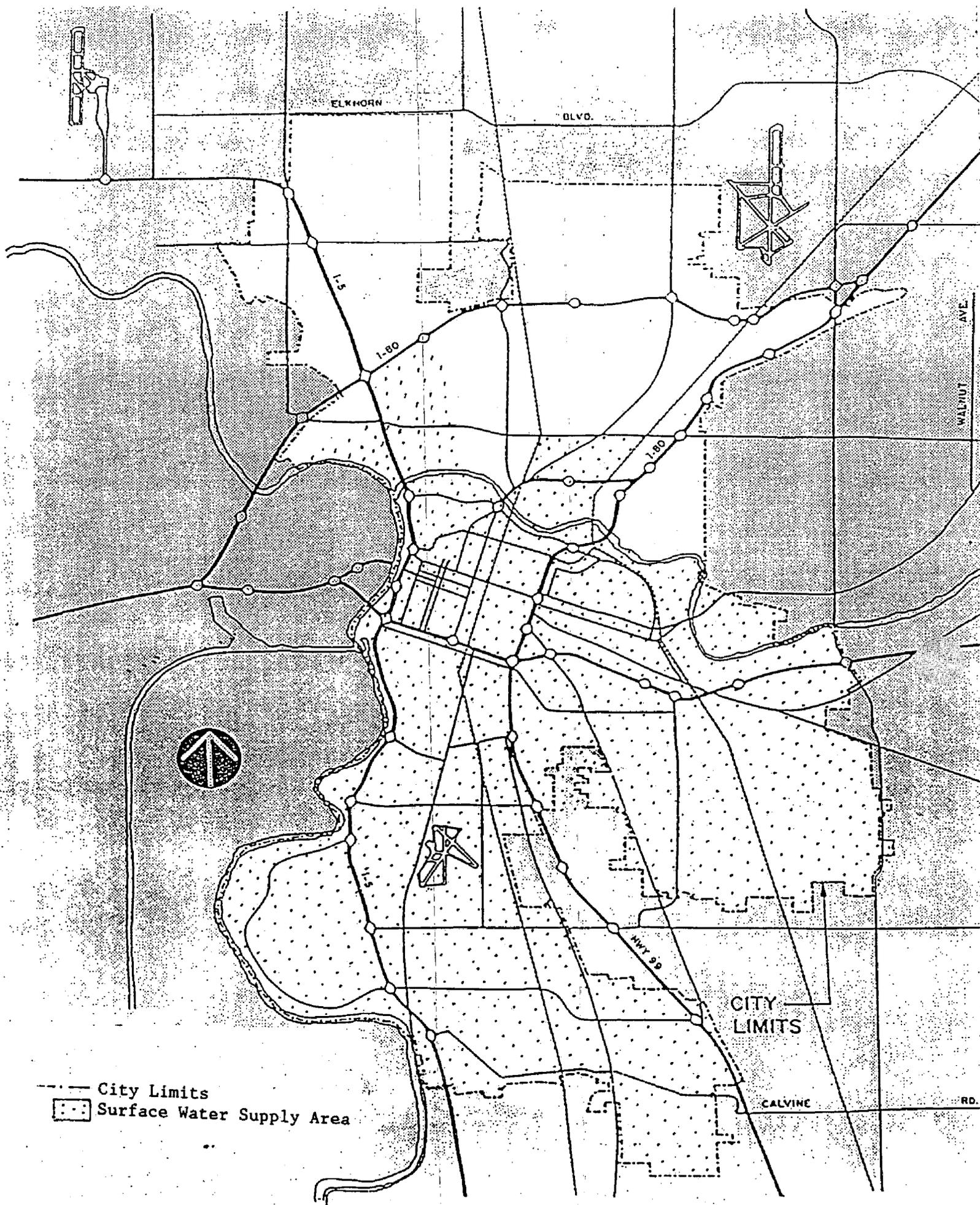


FIGURE 1

The gradual but consistent decline in the groundwater table indicates that groundwater should not be considered as a primary source of supply in the future. Existing and new wells should be maintained for emergency sources of supply and system peaking. In future planning, sufficient surface supplies should be projected to replace groundwater supplies as the primary water source.

CURRENT STATE OF CITY WATER SYSTEM

The existing treatment and storage capacity of the City's facilities is just adequate to meet current total water supply demands. Some additional major transmission mains are needed to provide surface water to all areas of the city. An ongoing program to extend these mains has been proceeding over the past few years, as current revenues allow.

If development within the City were to cease, this program could be continued with little or no change in the current rate structure. Since the terms of the Water Revenue Bond agreement specify that revenues must exceed operating costs and debt service, some revenue surplus occurs each year. This surplus may be used to construct and replace system facilities. Since the system is in generally good condition, replacement and minor expansion can occur within existing revenues for the foreseeable future.

As discussed above, the City's existing water requirements are met by a combination of filtered surface water and well (groundwater) supplies. In fiscal year 1986-87, the City service area contained a population of 327,160. During this period, the City served a total of 37 billion gallons of water, or an average consumption of 309 gallons per day per resident, with a maximum daily use of 182 million gallons. Of the total annual requirement, 83 percent was supplied by surface water and the remaining 17 percent by wells. Filtered surface water was more or less evenly divided between the Sacramento River Water Treatment Plant and the Fairbairn Water Treatment Plant. A summary of the total annual water demand for the City since fiscal 1967-1968 is presented in Figure 2.

WATER RIGHTS

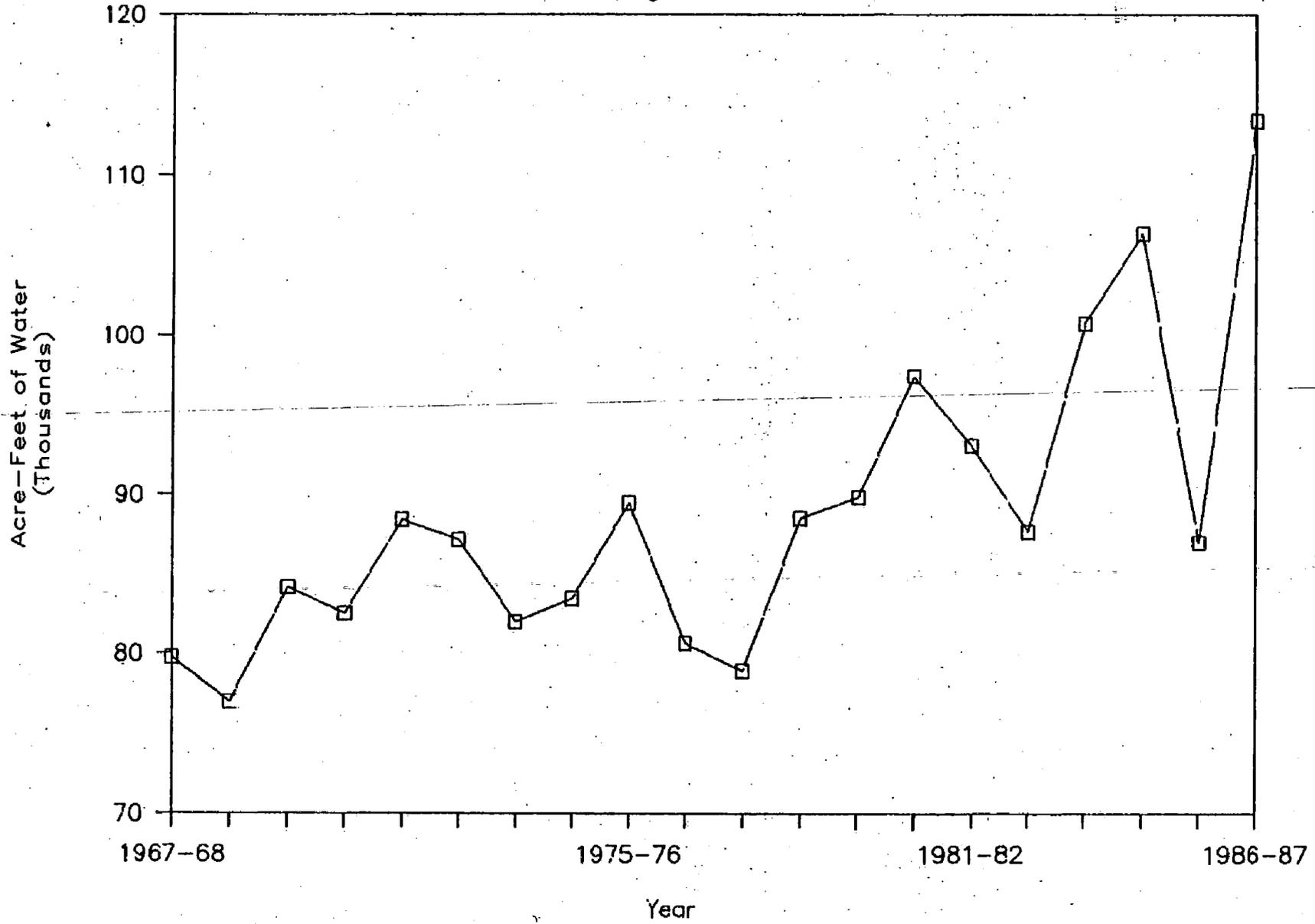
The present surface water supplies of the City are provided by the Sacramento and American Rivers. Although both are excellent supplies for municipal use, the quantity available from each source is limited by water right permits issued by the State Water Resource Control Board (SWRCB). The three basic water rights held by the City are illustrated in Figure 3. This figure indicates the application number and date, the permit number and date of issue, the rate of diversion in cubic feet per second (cfs), and the annual limit in acre-feet (ac-ft) for each source.

While the Sacramento River permit originally allowed continuous year-round diversions at the maximum rate, it was amended in 1969 to limit annual diversions to 81,800 ac-ft. This limitation is consistent with our normal peak-to-average use pattern. The permit had an original expiration date of 1960; however, extensions of time have been granted approximately every ten years. (State law allows extension of time when a permittee's water use is continuing to increase as growth occurs). The permit is due to expire during 1988, and an application for extension will be prepared and submitted by the City in mid-1988. As the City is meeting the criteria for extension by continuously expanding facilities to use water under the permit, the approval of the extension is anticipated.

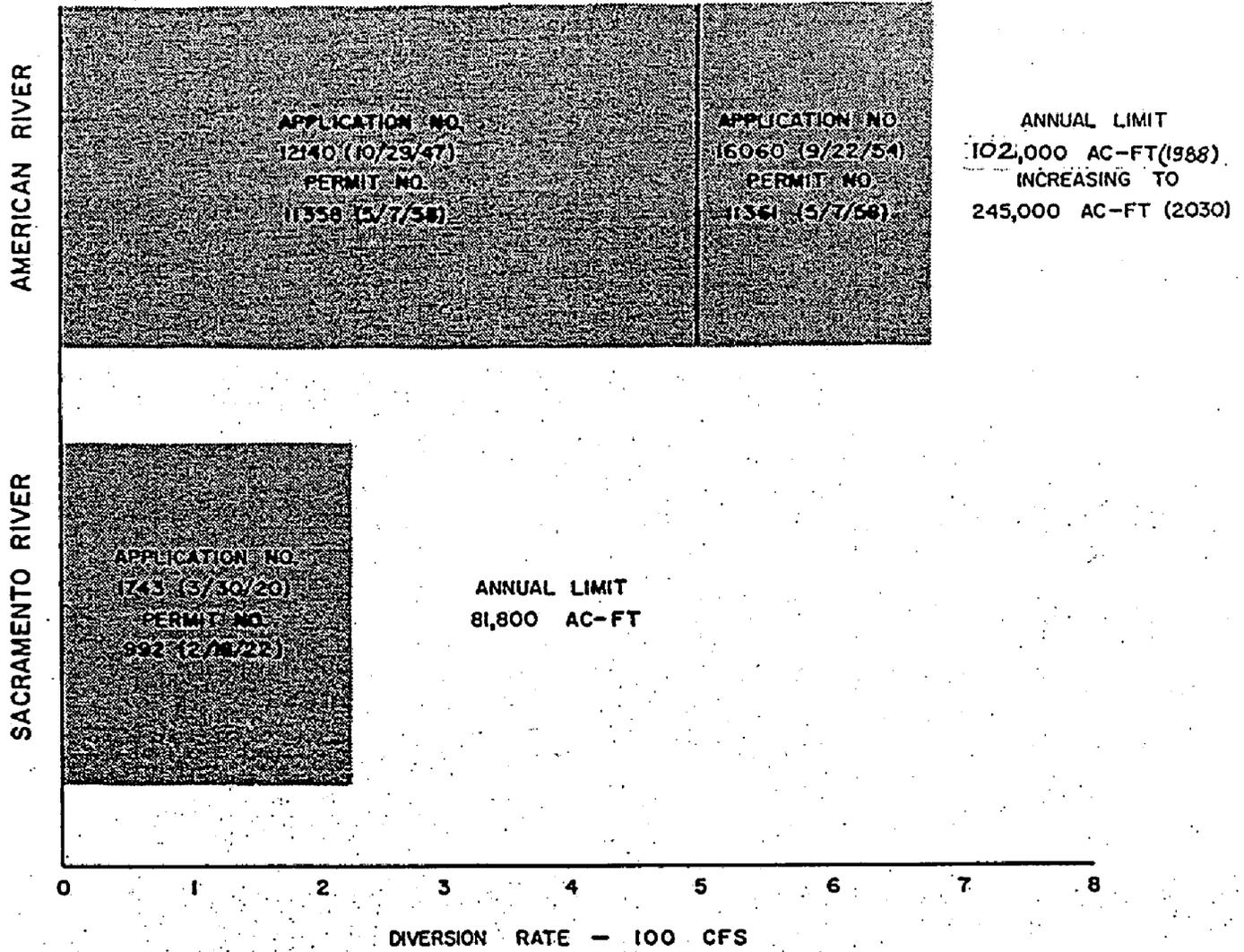
The American River permits allow diversions of natural stream flows only during the period from November 1 to August 1 each water year. Since any water to be diverted between August 1 and November 1 must be stored and released into the river, the City entered into a permanent contract with the U.S. Bureau of Reclamation in 1957 to purchase water stored behind Folsom and Nimbus Dams. This contract for storage provides the City's supply during the period August 1 through October 31, when diversion of natural flows is not permitted.

CITY WATER DEMAND

Figure 2



EXISTING WATER RIGHTS



SUMMARY OF MAXIMUM DIVERSION RATES:

SACRAMENTO RIVER	225	CFS	(146 MGD)
AMERICAN RIVER	675	CFS	(436 MGD)
TOTAL	900	CFS	(582 MGD)

FIGURE 3

The City must pay for this water at the rate of \$9.00/ac ft, whether the water is used or not. However, as a result of the assignment of additional storage permits from the Sacramento Municipal Utility District (SMUD), the City is allowed credit for SMUD's upriver storage. This reduces significantly the amount of stored water for which the City must pay. As an example, in 1987 the City paid \$180,000 to the USBR for stored water. Without the credit for the SMUD storage, the payment would have been \$315,000.

The primary effect of the assignment of the SMUD permits and the Bureau Contract is to provide a reliable year-round supply from the American River through storage releases during the period from August 1 to November 1. Although these arrangements increase the total annual amount of water available from the American River, the maximum diversion rate at any time cannot exceed 675 cfs (436 mgd) as specified in the two original American River permits. In conjunction with the water appropriated from the Sacramento River, the City is assured of a year-round supply of high quality surface water.

Authorized Water Right Places of Use. The presently authorized places of use (POU) under the City's water rights do not encompass the entire metropolitan area. While there is considerable overlapping of the City's various water rights places of use, there is a different description and map for each. The boundaries of these places of use have been modified over the years and are illustrated in Figure 4:

1. Under Permit 992 for diversion from the Sacramento River, the authorized place of use is the area within the city limits.
2. Under permits 11358 and 11361 for diversion from the American River, the authorized place of use is 79,500 acres within and outside the City limits.
3. Under permits 11359 and 11360 for diversion from the American River, the authorized place of use is 96,000 acres within and outside the City limits.

The terms and conditions of the City's contract with the USBR are quite favorable, and it is essential that any water management plan not jeopardize the City's water rights by seeking changes to the limits of the authorized places of use. This would require action by the SWRCB and could reopen discussion about the City's water rights in general.

WATER POLICY

Historically, it has been the policy of the City to serve water only inside the City limits. Minor exceptions have been occasioned by the purchase of smaller water systems whose service areas extended outside those boundaries.

Agreements for the sale of untreated water from the American River to water utilities within the water rights place of use were executed only with other public agencies. No contracts or agreements have been executed with private (investor-owned) water systems.

Sacramento County policy has discouraged expansion of private (or investor-owned) water utilities outside their existing designated service areas. Instead, the expansion or formation of public agencies to serve new development outside existing private water system service areas is promoted.

WATER RESOURCE MANAGEMENT PLAN

In January of 1985, the consulting firm of Metcalf and Eddy developed a Sacramento Area Water Resources Management Plan. Under this plan, governmental agencies are assigned specific roles with regard to a long range water management program.

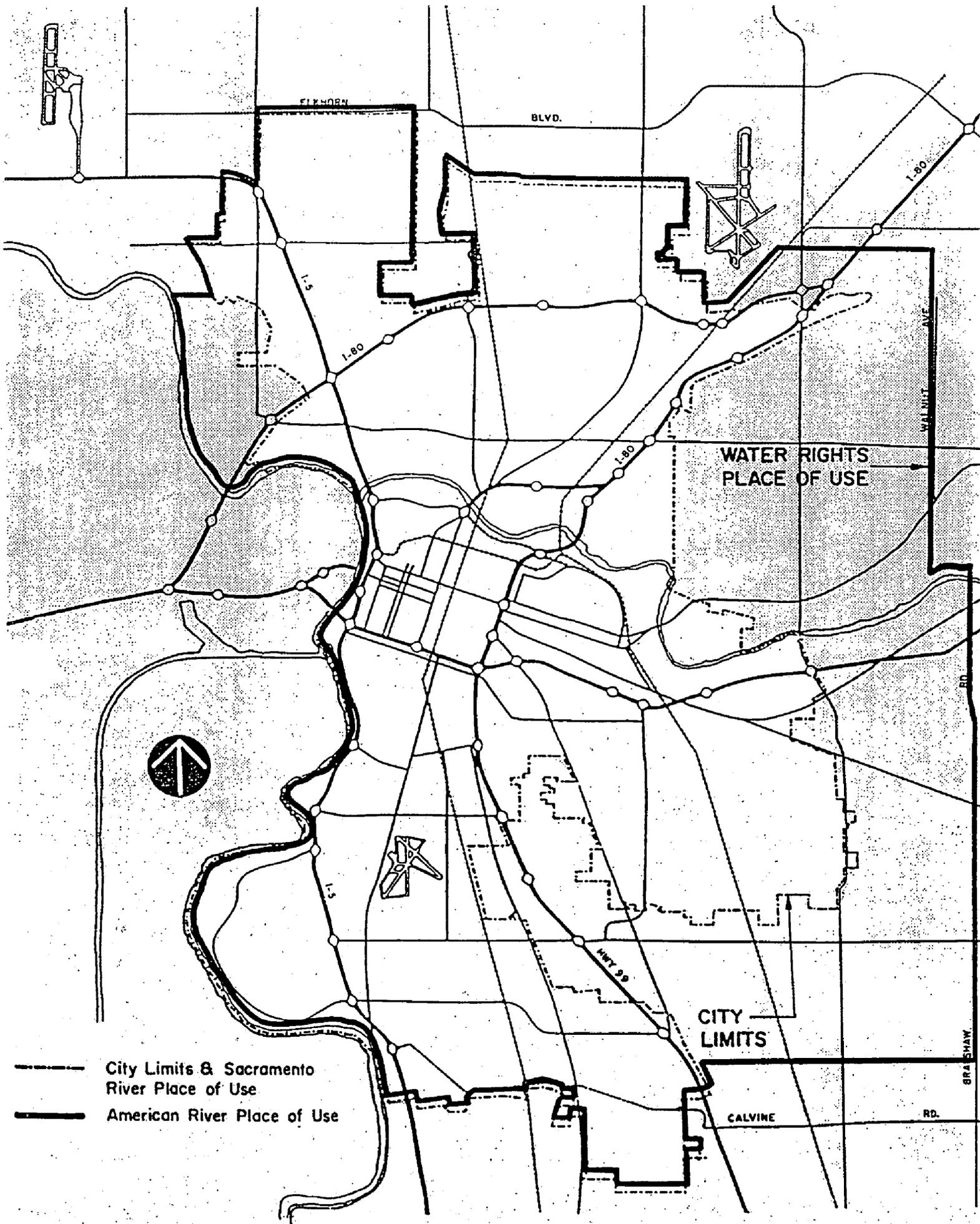


FIGURE 4

The City will plan, construct, and operate treatment and major distribution facilities to provide treated surface water to public utilities that choose to participate in a metropolitan plan. The City will utilize its existing surface water rights to serve those areas within the authorized place of use. For areas outside this place of use, the City will use water entitlements acquired by others. The City and County staff are developing an agreement to define more specifically the responsibilities of each agency, cost allocation, financing plans and procedures, and other terms and conditions.

The County Water Agency will be responsible for formation and administration of groundwater management zones and surface water benefit zones. The agency will assess, collect, and disburse fees and charges to meet the financial obligations of these zones. The City will support and cooperate with the groundwater management plan being developed by Sacramento County.

WATER DEMAND PROJECTIONS

The growth of water requirements within the City of Sacramento service area has been discussed in a number of previous reports. The estimated future requirements were developed with population and land use projections prepared by the City's Planning and Development Department and water use studies performed by the Water Division and special consultants. The assumptions are: (1) An annual average growth rate of 2.5%, and (2) areas outside the City that might contract for bulk surface water sales will continue to supply 40% of their needs with groundwater.

FUTURE CITY WATER SUPPLY REQUIREMENTS

The demand on the City's water system has grown steadily over the years and is now accelerating, due to rapid development under way in the north (Natomas) and the south areas of the City. The impact of these high growth areas must be taken into account along with continuing infill and population increases in the previously established City area.

The Water Division has periodically re-estimated the City's expected water needs over the years. However, the many different scenarios that development might take over the next twenty years makes forecasting difficult. Each possibility brings with it separate and distinct demands on the water supply system. At the present time, the proposed development of the North Natomas area presents the greatest potential impact and demand on City water supply planning.

NORTH NATOMAS

All of the North Natomas area lying within the City limits is in the City's water rights place of use; that is, the area that may be served under the City's current surface water entitlement. Therefore, the City anticipates ultimately serving water to the entire area inside the City limits. A long range plan for serving water to any large area requires an orderly program for extension of major water mains, construction of storage and pumping facilities, and expansion and/or addition of production capacity in advance of new water demands.

The City authorized the consulting firm of Dewante and Stowell to prepare two reports on plans for a water system to serve the North Natomas Area. The first, "Water Study, North Natomas Area, December, 1984" developed water requirement data, conceptual design criteria, alternative sources, and cost estimates for the alternatives. The second report, "Supplement to Water Study, North Natomas Area, April, 1985," contained water system cost estimates for five land use alternatives and one alternative for a stadium and sports arena only. The Dewante and Stowell report provided a four-phase program to reach ultimate demand.

Each phase would involve an expansion of treatment plant capacity, transmission and storage additions, and appurtenances. The first phase would include some wells for groundwater supply, assuming groundwater quantity and quality are satisfactory. Cost estimates for total development and for phases were prepared. These estimates were based on more refined use data and facility plans than those in the first report.

During most of the year, the primary source of supply for North Natomas will be the Sacramento River Water Treatment Plant. The ultimate plan calls for two transmission main crossings of the American River. Should conditions change significantly during the development, the size of the second main could be increased or decreased as appropriate. If a decision is made in the future to build a treatment plant on the Sacramento River in the Natomas area, one of the mains crossing the American River could be reduced in size.

City staff plans to drill a test well in the general area of the sports complex in 1988 to determine the feasibility of substantial groundwater use to supplement surface water supplies during peak summer use periods and dry years. Not only is groundwater supply from wells generally competitive economically with distribution storage reservoirs and pumping stations, it also provides a certain element of reliability in the event of a power outage at a treatment plant or a transmission main break.

FUTURE NON-CITY WATER REQUIREMENTS

As a direct result of the City's change in policy (as previously discussed) several water purveyors have expressed interest in bulk water purchases from the City. Informal discussions have taken place with these interested parties and the general long term water supply needs have been outlined. Arcade Water District has indicated for a number of years that they would be interested in participating in the expansion of the Fairbairn Water Treatment Plant in return for an additional source of water supply. Arcade presently utilizes groundwater for the most part but does divert several thousand acre-feet of American River water to augment its supply. Arcade's long range projection for treated surface water purchases from the City is estimated to be 13 MGD.

Citizen's Utilities Company, Fruitridge Vista Water District, and Florin County Water District have all expressed interest in contractual bulk water purchases from the City. Their combined requirement is estimated to be around 10 MGD.

The Laguna area must obtain surface water supply in order to develop over the long term. Sacramento County staff is currently discussing with City staff the possibility of contractual treated bulk water sales. The circumstance for this contract will be much different from those that might be negotiated with Arcade, Fruitridge Vista, Florin, and Citizens Utilities. Each of these lies within the City's POU. The County's needs in the Laguna development near Elk Grove are outside the City's POU. In order for the City to deliver water to this area, the County must first obtain its own independent surface water rights. The City would then divert, treat, and deliver water to the County's specified areas by contract. The estimated ultimate requirement for the Laguna area is 100 MGD. Laguna development will be supplied from the Fairbairn facility during most periods of the year.

FACILITY REQUIREMENTS

In order to meet the water supply demands outlined in the previous section, significant expansion of the City's existing surface water facilities will be necessary. The following discussion of the capital improvement program describes facility requirements, a schedule for construction, and estimated costs.

WATER TREATMENT PLANTS

Expansion of the existing Sacramento River and Fairbairn Water Treatment Plants will be the initial steps taken to meet future water supply demands. The Sacramento River facility will be expanded by 35 MGD by 1990 and the Fairbairn Plant by 100 MGD by 1991.

It may be necessary during a short portion of the year to serve all areas from the Sacramento River Plant, from groundwater supplies, or a combination of the two in order to perform annual routine maintenance at the Fairbairn Plant. This procedure is a logical part of the City-County conjunctive use philosophy. Where wells already exist, and in areas of acceptable groundwater quality, groundwater will be used for short periods of maximum daily demand.

Treatment Capacity. It is intended that within the City limits surface water be used almost exclusively. Existing wells will be used for short peak use periods during high demand summer days. Wells may also be constructed in newly developing areas as interim supplies while transmission mains are being built. However, groundwater use after expansion of the two plants in 1990-1991 is not expected to exceed from three to five percent of total annual use inside the City limits. Figure 5 shows projected treatment capacity requirements for the entire service area expected to be covered by agreements with the County and other water utilities. This figure also shows a City-only projection of treatment capacity requirements.

It appears at this time that expansion of treatment capacity in 100 MGD steps will be reasonable, and future plant expansions are indicated in Figure 6. Plant expansion intervals have been shortened due to the assumption that the City will have agreements with the County and other water utilities for supplying surface water through City facilities.

Storage Requirements. The economics of storage vs treatment capacity for meeting peak demands indicate that storage capacity should equal about 20 percent of maximum day treatment capacity. Where groundwater quality and quantity are adequate, wells are usually cost effective in lieu of storage. The difference in cost between wells and storage is relatively insignificant in the total water system cost picture, however, and it is appropriate to assume a mixture in the long term plan. As a general rule, a three million gallon reservoir will be constructed for each 25 MGD increase in water treatment plant capacity.

Transmission Mains. On the average, about three miles of transmission main must be constructed for each square mile of developed area. This translates into about three fourths of a mile of transmission main for each 1 MGD of treatment capacity. Figures 7, 8 and 9 show projected additions of transmission main and storage reservoirs in three phases. In each figure, the cross-hatched area indicates approximate areas of development requiring those facilities. The dashed lines indicate facilities installed in previous phases. Exact locations of mains and reservoirs are subject to change, since the developing areas may not occur in the sequence assumed. However, the quantity and cost of the facilities would not vary significantly for a given area of development.

Some of the transmission mains and storage reservoirs shown are outside the City limits and may be constructed by the County. They are shown in order to illustrate the probable total water system requirement. Whether constructed and financed by the County, or by the City with reimbursement by the County, the proposed financial plan would be essentially the same.

FINANCIAL

Since 1960, major water system additions have been financed through water revenue bonds. Debt service has been financed from water user fees. Debt service has been a relatively small part of total annual water system expenses, so the burden on existing ratepayers has not been severe. The expansion of facilities currently planned to meet anticipated growth will involve costs that would result in a significant increase in rates if the entire burden of debt service were placed on ratepayers. Costs per acre of development should vary little, regardless of the size of expansion. For the entire area, the average cost for major facilities is expected to be about \$6,000 per net acre served. However, the water development fee increase adopted in 1987 will assess about two thirds of water system expansion costs against new development, with ratepayers bearing the remaining one third.

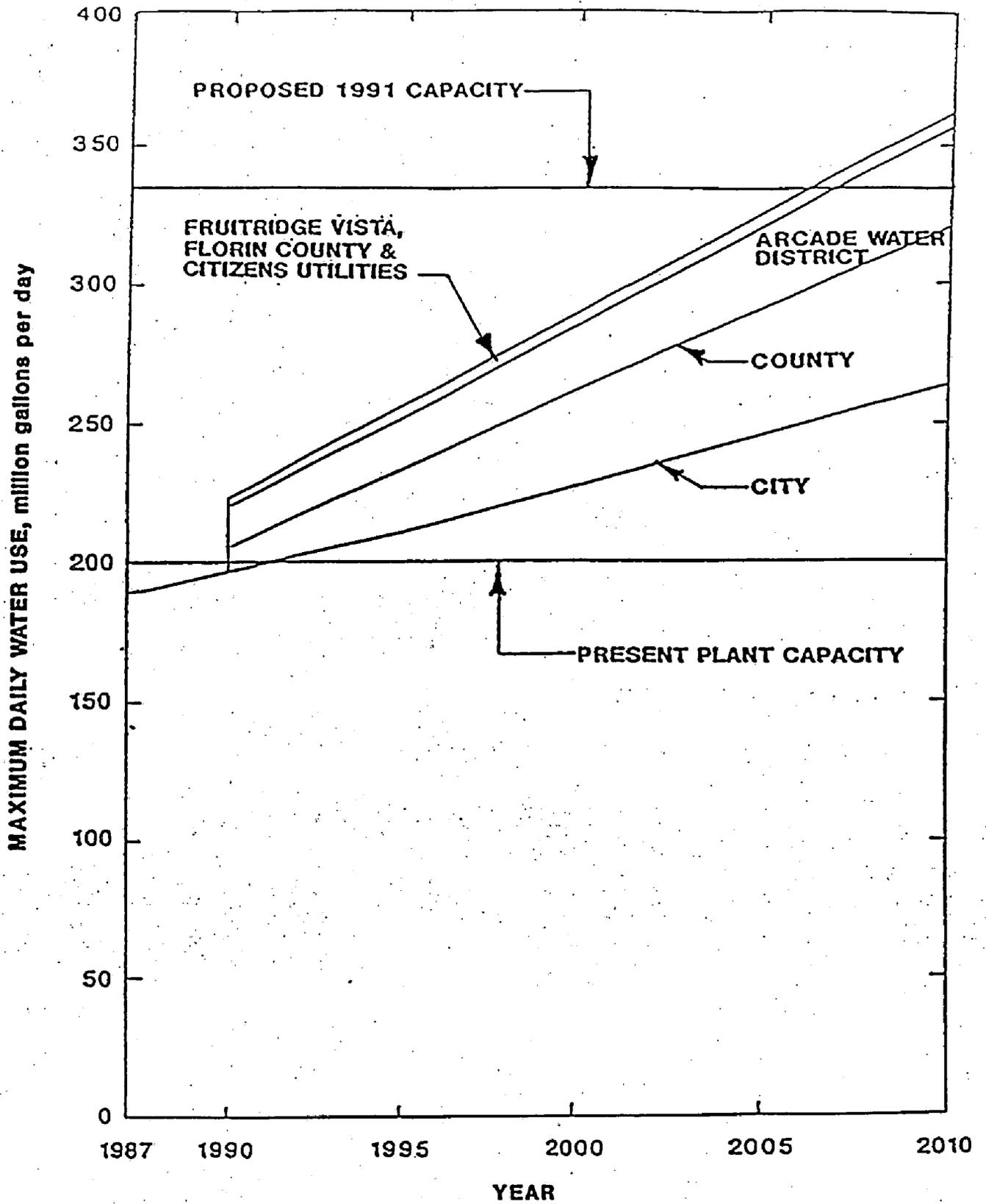
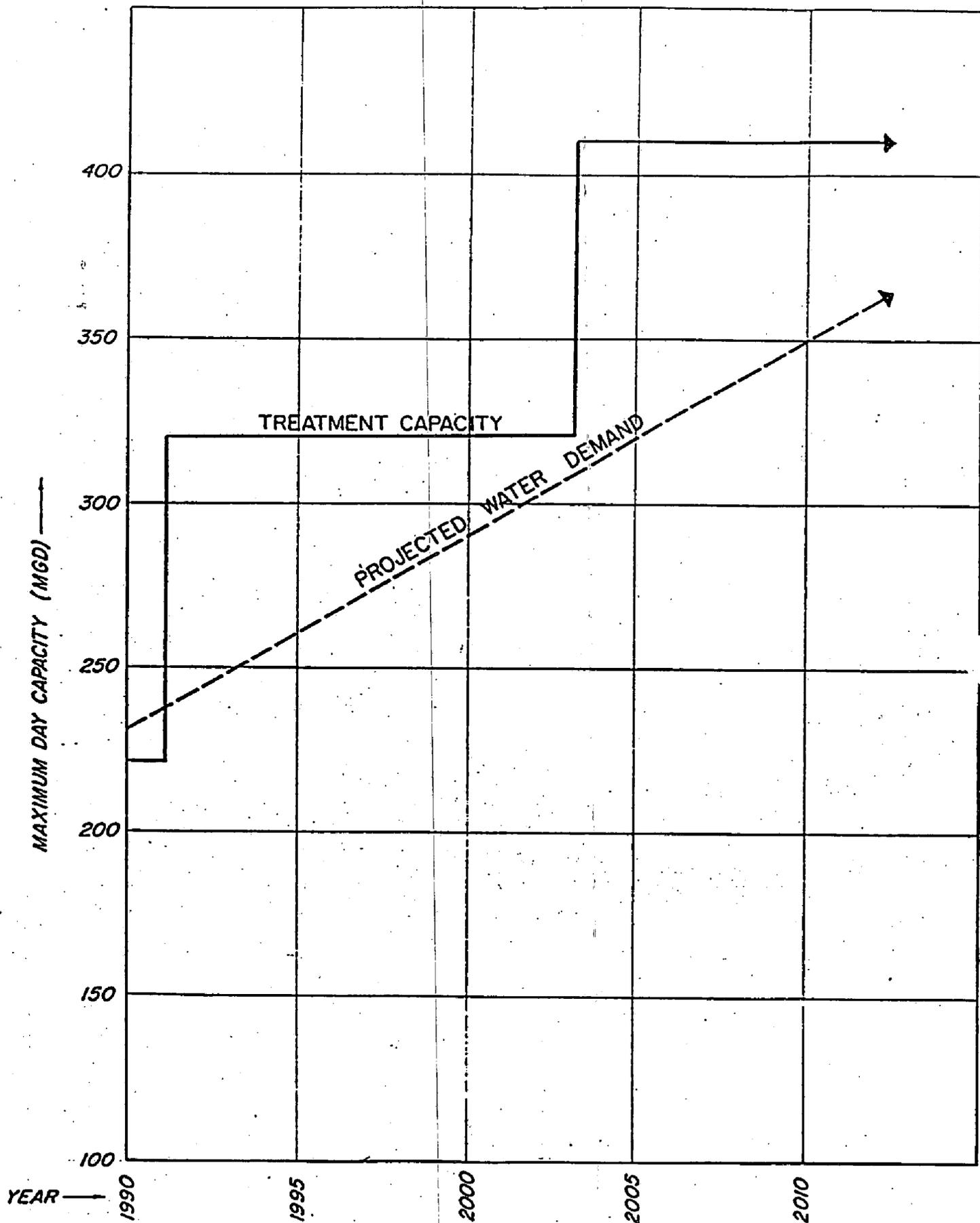


FIGURE 5

PROJECTED MAXIMUM DAY WATER DEMAND



CITY OF SACRAMENTO
 PROJECTED WATER DEMAND AND TREATMENT CAPACITY, 1990-2010
 FIGURE 6

The initial units of system expansion, (treatment plant expansion, reservoirs, and major north-south transmission mains) will require debt financing. Additional transmission mains and reservoirs will be required as growth occurs, and water development fee revenue from that growth should be sufficient to finance the required facilities.

The current expansion of Sacramento River Plant capacity, costing less than \$5 million, is being financed from Water Fund reserves. Expansion of the Fairbairn Plant is expected to cost about \$40 million. Associated major north-south transmission mains and local reservoirs will cost an additional estimated \$15 million. Therefore, debt financing will be needed for an estimated \$55 million. Annual debt service is estimated to be about \$4 million, and approximately one third of the revenue needed for this debt service is expected from non-City sources. It is probable that Arcade Water District, Sacramento County, and other water utilities will obligate themselves for about one third of the capacity of the new facilities. Whether these obligations are paid "up front" by these other agencies or on an annual basis, the effect on City revenue requirements would be approximately the same.

Essentially, City revenues required for debt service would be about \$3.5 million. Assuming debt service coverage requirements similar to the existing factor (1.3 x debt service), required revenue would be about \$4.5 million annually. If one third, or \$1.5 million, is derived from user fees, an increase in water rates of about 10 percent will be needed. The remaining \$3 million would come from water development fees. At the current fee of \$1500 per single family equivalent, just 2000 new connections per year would provide the needed revenue. This represents a growth rate of a little more than one percent, lower than the City has experienced in any recent year.

After the initial major expansion, revenue from water development fees will be somewhat self adjusting. If growth rates increase, development fee income would increase as the need to expand facilities to meet growth increases. Even a substantial decrease in growth rates would have a relatively minor impact on monthly water rates. As an example, if growth decreased to 100 new connections in a given year, an additional \$1.5 million for debt service could be placed on ratepayers, resulting in a rate increase of about 10 percent. Even under this scenario, the increase in rates could be reduced if the County or other water utilities needed additional capacity and assumed the associated additional financial obligation.

In summary, debt financing appears to be necessary for the initial system expansion during the 1988-1991 period. After this, annual revenues from rates and water development fees should meet financial requirements for growth induced expansion. Slowing of growth rates should have relatively minor effects on user rates.

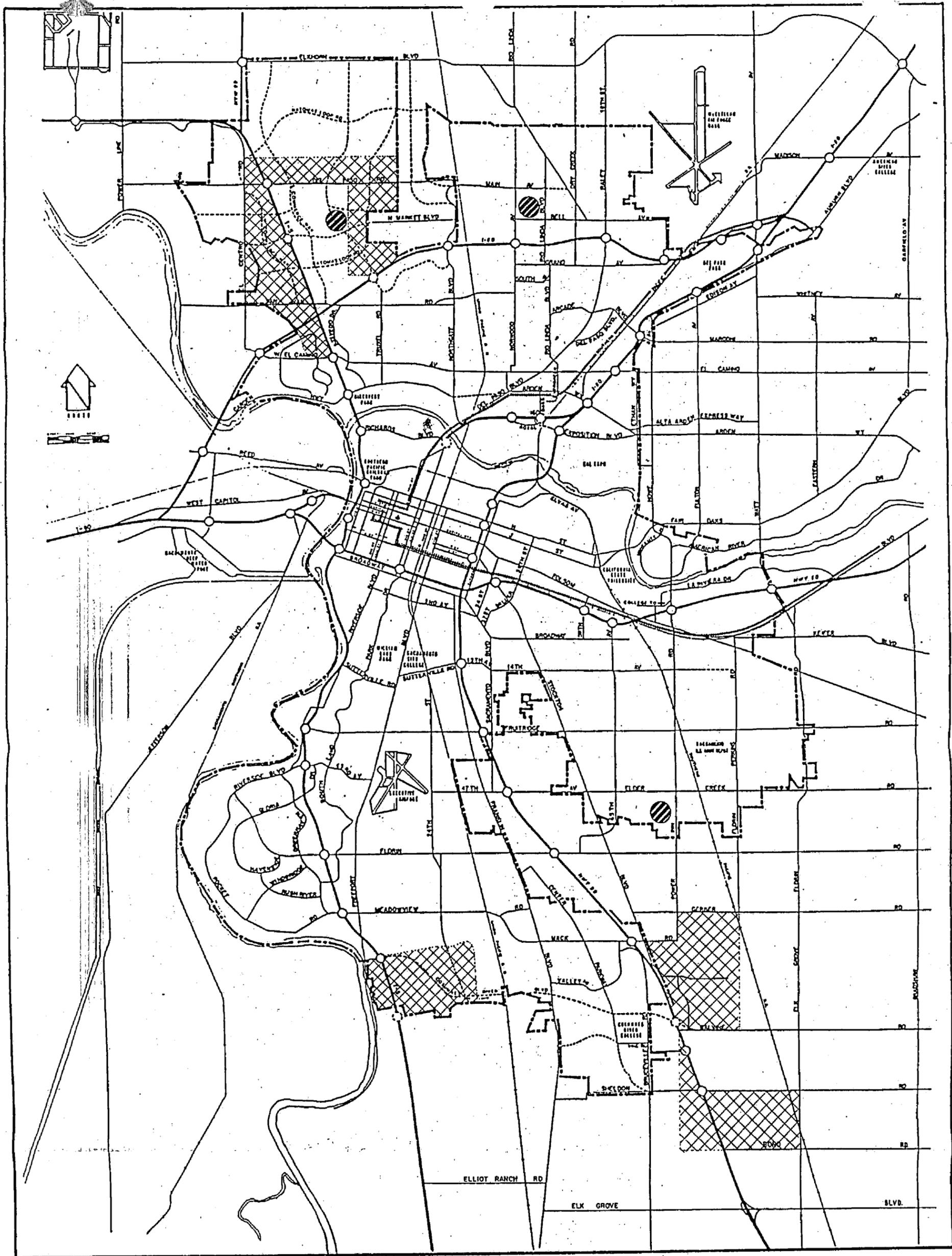
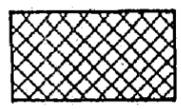


FIGURE 8 - PHASE 2, YEAR 2000



Additional service area
for this phase



Reservoirs and pumping stations

New

Existing

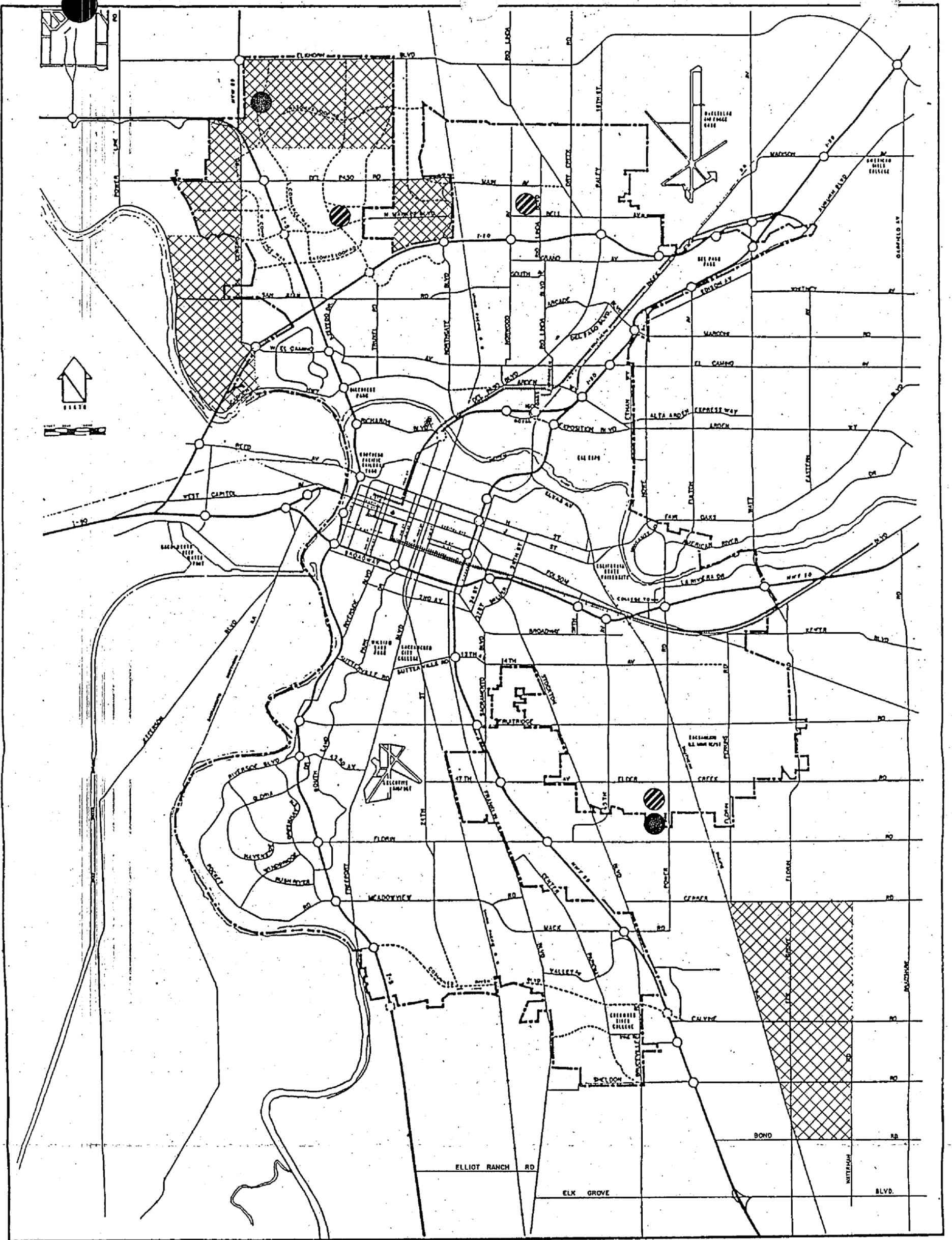


FIGURE 9 - PHASE 3, YEAR 2010



Additional service area
for this phase



New



Existing

Reservoirs and pumping stations