



SACRAMENTO COUNTY
WATER AGENCY



Sacramento County Water Agency

Zone 40 Water Supply Master Plan

February 2005



Executive Summary



EXECUTIVE SUMMARY

The Executive Summary provides a brief overview of the content and the water supply issues addressed through the development of the Zone 40 Water Supply Master Plan (WSMP) document. This WSMP was developed by Sacramento County Water Agency (SCWA) and MWH staff to include policies and decisions made since 1987 when the original Master Plan was developed. This includes the adoption by SCWA of the Water Forum Agreement (WFA) in January 2000.

FORMATION OF ZONE 40

A brief history of Zone 40 is provided below:

SCWA was formed in 1952 by a special legislative act of the State of California making water available for any beneficial use of lands and inhabitants, and for producing, storing, transmitting, and distributing groundwater. Zone 40 was created by SCWA Resolution No. 663 in May 1985, which describes the exact boundaries of the zone, and defines the projects to be undertaken.



PURPOSE OF WSMP

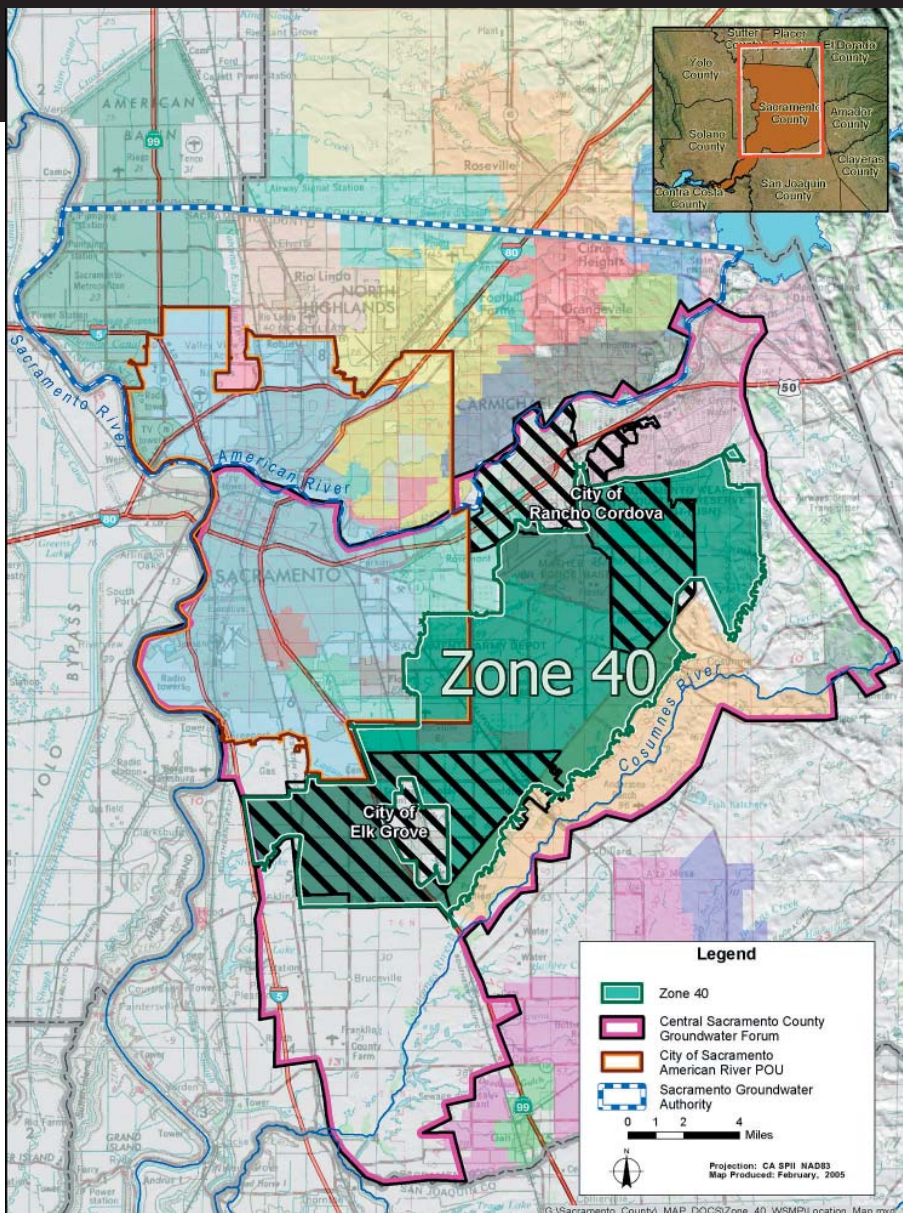
SCWA Ordinance No. 18, adopted in 1986, empowered SCWA to establish fees, charges, credits, and regulations for the wholesale supply of water to zones within SCWA. A master plan is required by this ordinance. In 1987 a Water Supply Master Plan (1987 Plan) for Zone 40 was developed to satisfy this requirement.

The 1987 Plan's preferred alternative was based on a set of assumptions regarding urban development patterns, water use demand patterns, groundwater availability, and surface water availability that have changed since the adoption of that plan.

The most significant changes to those assumptions resulted from a major modification of the Central Valley Project's (CVP) contracting policy that occurred as a result of the Central Valley Project Improvements Act (CVPIA), the signing of the WFA, and the adoption of the 1993 Sacramento County General Plan (County General Plan) update that substantially increased the area designated for urban growth in the County.

In order to account for these changes Zone 40's boundaries were modified, resulting in an expansion of the Zone from 17,200 acres (1987 Plan) to 86,000 acres (**Figure ES-1**).

Figure ES-1. Project Location Map



The WFA also included estimates of sustainable groundwater yield that were supported by more extensive hydrologic and hydrogeologic information for the central groundwater basin underlying Zone 40. New conditions regarding groundwater contamination and remediation efforts now underway in the county also affect water planning for Zone 40 further justifying the need to complete and update the WSMP in accordance with Ordinance 18.

The purpose of this WSMP is to address those changes made since the development of the 1987 Plan and to further define SCWA’s conjunctive use program of groundwater, surface water, and recycled water supplies, as well as a financing program for the construction of surface water diversion and treatment facilities; water conveyance pipelines; groundwater extraction, treatment, storage, and distribution facilities; and recycled water storage and distribution facilities within Zone 40.

ENVIRONMENTAL DETERMINATION

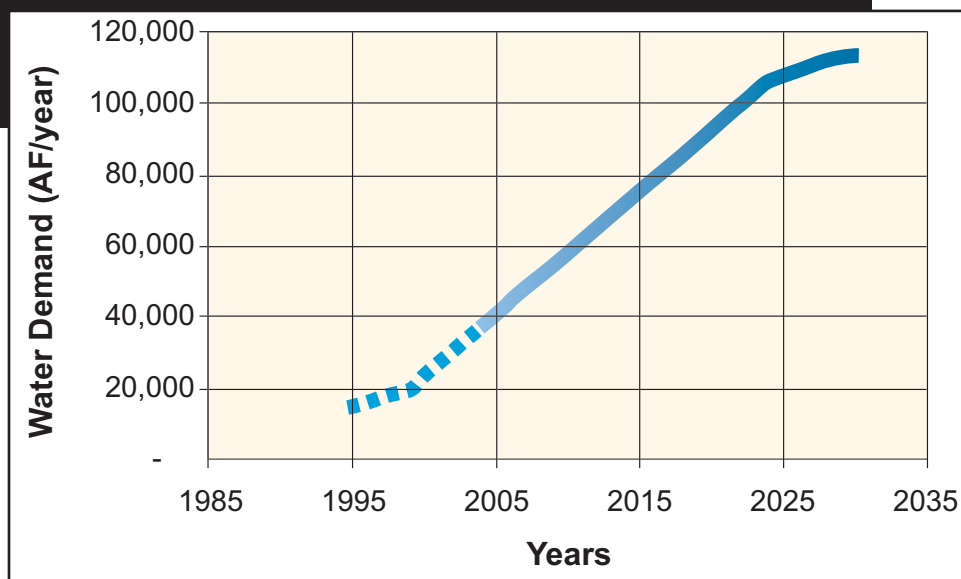
The WSMP, through the California Environmental Quality Act (CEQA), has undergone significant scrutiny by analyzing the impacts resulting from implementation of the recommended

WSMP facilities with emphasis on cumulative, indirect, and growth inducing effects that could occur with regional development supported by the plan. This included evaluating the affect of groundwater pumping in Zone 40 on the Cosumnes River and neighboring wells. Any mitigation, if required, is addressed in the Final Environmental Impact Report 2002 Zone 40 Water Supply Master Plan (FEIR) (EDAW, December 2004). The FEIR will be certified with the approval of the WSMP.

ZONE 40 WATER DEMANDS

The WSMP water demands are projected to increase at a steady rate from current levels to build-out of the County General Plan in 2024, and at a slightly reduced rate to 2030 (Water Forum build-out) as shown in **Figure ES-2**. An inventory of land use types, acreages, unit water demand factors, and projected water supplies were considered in the WSMP. The projected year 2030 Zone 40 annual water demand is 113,064 acre-feet per year (AF/year). Sacramento Municipal Utility District (SMUD) dry year supplies and use of remediated groundwater may require additional analysis to evaluate the delivery requirements of these water supplies.

Figure ES-2. Zone 40 Water Demands



AVAILABILITY OF GROUNDWATER AND SURFACE WATER

The Water Forum (WF) defined a Central Groundwater Basin long-term sustainable average annual yield of groundwater to be 273,000 acre-feet (AF). Within the context of this sustainable yield, the WSMP identifies and projects groundwater demands within the 2030 study area. While groundwater pumping is generally spread out across Zone 40, north of Elder Creek Road groundwater contamination and the potential for movement of contaminant plumes in the Aerojet-General Corporation (Aerojet) and Mather areas severely limits the opportunity to develop additional groundwater pumping facilities in these areas.

Management of groundwater is also a significant goal of Zone 40 to insure the long-term viability of groundwater supplies in the region. To this end, Sacramento County Water Agency (SCWA) completed and adopted a comprehensive Groundwater Management Plan (GMP) for Zone 40 (October 2004, SCWA and MWH) that meets the requirements of the State Water Code and provides opportunities to apply for California State Grant Funds such as in AB303 and Proposition 50, and also lays the foundation for development and implementation of an Integrated Regional Water Management Plan.

Surface water supplies to meet SCWA's conjunctive use objectives comes from a number of different contracts, each with its own set of requirements and special conditions. For example, the contract amount typically represents the amount of water that would be delivered in a wet or normal year. In a dry year less water is typically delivered than the contract amount. **Appropriative Water** represents an application made to the State Water Resources Control Board (SWRQB) for the appropriation of water from the American and Sacramento Rivers. This water is considered intermittent water that typically would be available during the winter months of normal or wet years and may average 14,586 AF/year. **SMUD 1 and SMUD 2 Surface Water** assignments are under the terms of a three party agreement (SCWA, SMUD, and the City), and in accordance with SMUD's Purveyors Specific Agreement (PSA) of the WFA. Each is for 15,000 AF/year for a total of 30,000 AF/year (26,000 AF/year on average). **Public Law 101-514 ("Fazio" Water)** was granted in April 1999 under a CVP water service contract pursuant to Public Law (PL) 101-514 that provides a permanent water supply to Zone 40 of 15,000 AF/year (13,551 AF/year on average). **Other Water Supplies** are water entitlements that are yet to be determined but are required for meeting the conjunctive use objectives set forth in the PSA. It is believed that up to 9,300 AF/year can be obtained from the City of Sacramento to serve that portion of Zone 40 that is located within the City's

American River Place of Use (POU). Additional water could come from purchases of water contracts upstream on the Sacramento River.

Lastly, **recycled water** is purchased by SCWA from the Sacramento Regional Wastewater Treatment Plant (Sac Regional), for non-potable uses. The expected maximum day use at completion of Phase 2 is approximately 9 mgd.

SELECTED WATER SUPPLY ALTERNATIVE

The **Freeport Regional Water Project** alternative was selected as the WSMP's preferred alternative. This alternative relies on a variety of surface water supplies that are diverted off the Sacramento River and then conveyed to a surface water treatment plant (WTP) located within Zone 40. **Figure ES-3** illustrates how water supplies meet water demands on average over a year. Because of the potential for shortages in surface water supplies, this alternative requires that a certain amount of supply redundancy be included in its capital facilities (i.e., groundwater production and treatment facilities). **Figure ES-4** illustrates the average use of groundwater and surface water over the WSMP planning period. The three sharp increases in surface water use represent the phases of surface WTP construction.

While portions of this alternative are completed in conjunction with East Bay Municipal Utility District (EBMUD), the overall implementability of this element is rated as high due to the high level of control that SCWA will retain over implementation. No significant environmental constraints were identified for this alternative in the FEIR.

WSMP IMPLEMENTATION

The WSMP requirement to identify projects and meet financial goals in given timeframes is covered in Section 7 and Section 8 of this document. Specific details on the Zone 40 financing plan can be found in the Feasibility Report for 2003 – Sacramento County Water Financing Authority Revenue Bonds (Sacramento County Water Agency Zones 40 and 41 Water System Projects) (MWH, May 2003).

Another document, being developed as a companion document to the WSMP, is the *Zone 40 Water System Infrastructure Plan* (WSIP). The WSIP will bridge the gap between the larger regional projects identified in WSMP and the smaller non-regional projects that actually move water to the wholesale and retail customers of Zone 40. The combined efforts of these documents, including the Zone 40 GMP, will be the foundation for insuring sustainable water supplies through 2030.

Figure ES-3. Monthly Water Supplies and Water Demand Under Preferred Alternative

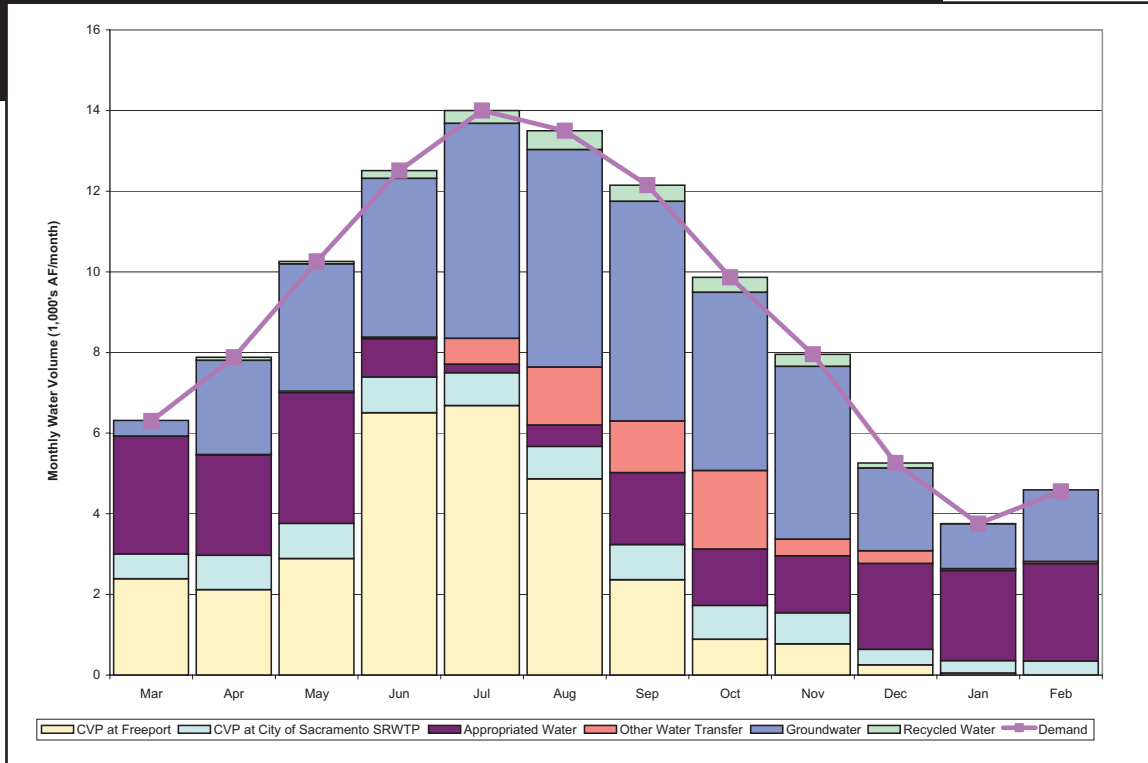


Figure ES-4. Schematic of Average Groundwater and Surface Water Use

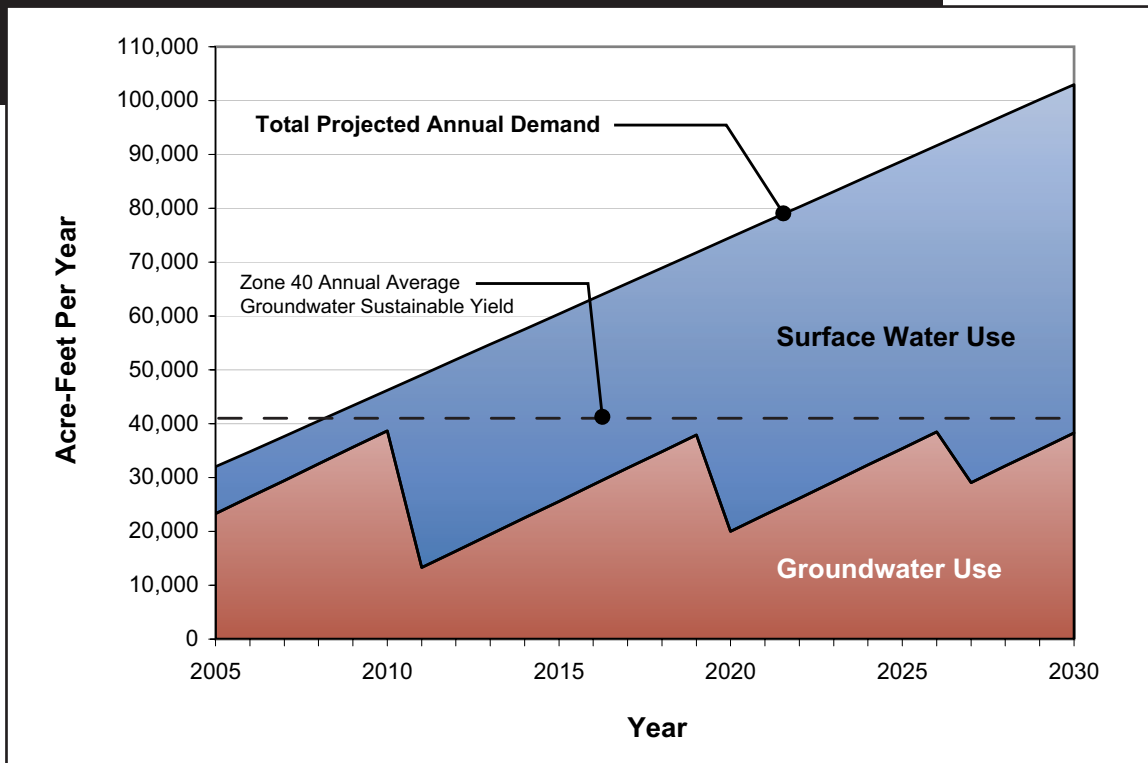


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ABBREVIATIONS AND ACRONYMS

<i>Aerojet</i>	<i>Aerojet-General Corporation</i>
<i>AF</i>	<i>acre-feet</i>
<i>AF/Ac/Yr</i>	<i>acre-feet per acre per year</i>
<i>AF/year</i>	<i>acre-feet per year</i>
<i>AFA</i>	<i>acre-feet annually</i>
<i>AFB</i>	<i>Air Force Base</i>
<i>Agency Act</i>	<i>Sacramento County Water Agency Act</i>
<i>Baseline Report</i>	<i>Report titled, Baseline Conditions for Groundwater Yield Analysis (Montgomery Watson, 1997)</i>
<i>BAT</i>	<i>Best Available Technology</i>
<i>BBWTP</i>	<i>Bryte Bend Water Treatment Plant</i>
<i>BMP</i>	<i>Best Management Practice</i>
<i>Board</i>	<i>Sacramento County Water Agency Board of Directors</i>
<i>Boeing</i>	<i>Boeing or McDonnell-Douglas</i>
<i>Boyle Report</i>	<i>Report titled, Estimate of Annual Water Demand within the Sacramento County- Wide Area (Boyle Engineering Corporation, 1995)</i>
<i>Cal-Am</i>	<i>California-American Water Company (formerly known as Citizens Utilities Company of California)</i>
<i>CBO</i>	<i>Community Based Organizations</i>
<i>CCP</i>	<i>Central Conveyance Pipeline</i>
<i>CCR</i>	<i>California Code of Regulations</i>
<i>Central Basin</i>	<i>Central Sacramento County Groundwater Basin</i>
<i>CEQA</i>	<i>California Environmental Quality Act</i>
<i>CI</i>	<i>Commercial and Industrial</i>
<i>CII</i>	<i>Commercial, Industrial, and Institutional</i>
<i>CIP</i>	<i>Capital Improvement Program or Project</i>
<i>City</i>	<i>City of Sacramento</i>
<i>County General Plan</i>	<i>1993 Sacramento County General Plan Update</i>
<i>County</i>	<i>The County of Sacramento</i>
<i>CP</i>	<i>Conveyance Pipeline</i>
<i>CSCGF</i>	<i>Central Sacramento County Groundwater Forum</i>
<i>CUCC</i>	<i>Citizens Utilities Company of California (now known as California-American Water Company)</i>
<i>CVP</i>	<i>Central Valley Project</i>
<i>CVP/SWP</i>	<i>Central Valley Project/State Water Project</i>
<i>CVPIA</i>	<i>Central Valley Project Improvement Act</i>
<i>DEIR</i>	<i>Draft Environmental Impact Report</i>
<i>DHS</i>	<i>California Department of Health Services</i>

<i>DPR</i>	<i>Department of Pesticide Regulation</i>
<i>DWR</i>	<i>State of California Department of Water Resources</i>
<i>EBMUD</i>	<i>East Bay Municipal Utility District</i>
<i>EDU</i>	<i>Equivalent Dwelling Unit</i>
<i>EGWW</i>	<i>Elk Grove Water Works (now known as Florin Resources Conservation District/Elk Grove Water Service)</i>
<i>EIR</i>	<i>Environmental Impact Report</i>
<i>EIS</i>	<i>Environmental Impact Statement</i>
<i>ENR/CCI</i>	<i>Engineering News-Record Construction Cost Index</i>
<i>EPA</i>	<i>United States Environmental Protection Agency</i>
<i>FCP</i>	<i>Freeport Conveyance Pipeline</i>
<i>FEIR</i>	<i>Final Environmental Impact Report 2002 Zone 40 Water Supply Master Plan</i>
<i>FEMA</i>	<i>Federal Emergency Management Agency</i>
<i>FF</i>	<i>Freeport Facilities</i>
<i>FRCD</i>	<i>Florin Resource Conservation District</i>
<i>FRWA</i>	<i>Freeport Regional Water Authority</i>
<i>GAC</i>	<i>granular activated carbon</i>
<i>General Plan</i>	<i>Sacramento County General Plan</i>
<i>GMP</i>	<i>Groundwater Management Plan</i>
<i>GPD/Ac</i>	<i>gallons per day per acre</i>
<i>GPD/DU</i>	<i>gallons per day per dwelling unit</i>
<i>gpm</i>	<i>gallons per minute</i>
<i>HAA5</i>	<i>Haloacetic Acid</i>
<i>IRCTS</i>	<i>Inactive Rancho Cordova Test Site</i>
<i>JCP</i>	<i>Joint Conveyance Pipeline</i>
<i>LT2ESWTR</i>	<i>Long -Term 2 Enhanced Surface Water Treatment Rule</i>
<i>M</i>	<i>Million</i>
<i>M&I</i>	<i>Municipal and Industrial</i>
<i>MCL</i>	<i>Maximum Contaminant Level</i>
<i>MCLG</i>	<i>Maximum Contaminant Level Goal</i>
<i>m/L</i>	<i>micrograms per liter (also parts per billion)</i>
<i>mg/L</i>	<i>milligrams per liter (also parts per million)</i>
<i>mgd</i>	<i>Million Gallons per Day</i>
<i>ML</i>	<i>multifamily</i>
<i>MMM</i>	<i>Multimedia Mitigation</i>
<i>MPN</i>	<i>Most Probable Number</i>
<i>NDMA</i>	<i>n-nitrosodimethylamine</i>
<i>NEPA</i>	<i>National Environmental Policy Act</i>
<i>NTU</i>	<i>Nephelometric Turbidity Unit</i>

<i>O&M</i>	<i>Operations and Maintenance</i>
<i>pCi/l</i>	<i>pico curies per liter</i>
<i>PL</i>	<i>Public Law</i>
<i>POU</i>	<i>Place of Use</i>
<i>ppb</i>	<i>parts per billion</i>
<i>ppm</i>	<i>parts per million</i>
<i>PSA</i>	<i>Purveyor Specific Agreement</i>
<i>PUC Certified Area</i>	<i>Original Certified Service Area granted to Florin Resources Conservation District/Elk Grove Water Service by the California Public Utilities Commission</i>
<i>RCF</i>	<i>Regional Conveyance Facilities</i>
<i>Reclamation</i>	<i>U.S. Bureau of Reclamation</i>
<i>RW</i>	<i>recycled water</i>
<i>RWA</i>	<i>Regional Water Authority</i>
<i>RWQCB</i>	<i>Regional Water Quality Control Board</i>
<i>Sac Regional</i>	<i>Sacramento Regional Wastewater Treatment Plant</i>
<i>SAWWA</i>	<i>Sacramento Area Water Works Association</i>
<i>SCADA</i>	<i>System Control and Data Acquisition</i>
<i>SCP</i>	<i>Sacramento Conveyance Pipeline</i>
<i>SCWA</i>	<i>Sacramento County Water Agency</i>
<i>SCWMD</i>	<i>Sacramento County Water Maintenance District (now known as Zone 41 of the Sacramento County Water Agency)</i>
<i>SDWA</i>	<i>Safe Drinking Water Act</i>
<i>SF</i>	<i>single family</i>
<i>SMUD</i>	<i>Sacramento Municipal Utility District</i>
<i>SRCSD</i>	<i>Sacramento Regional County Sanitation District</i>
<i>SRWTP</i>	<i>City of Sacramento's Sacramento River Water Treatment Plant</i>
<i>SWP</i>	<i>State Water Project</i>
<i>SWRCB</i>	<i>State Water Resources Control Board</i>
<i>TAF</i>	<i>Thousands of Acre-Feet</i>
<i>TDS</i>	<i>Total Dissolved Solids</i>
<i>TM</i>	<i>Technical Memorandum</i>
<i>TOC</i>	<i>Total Organic Carbon</i>
<i>TTHM</i>	<i>Total Trihalomethanes</i>
<i>ULF</i>	<i>Ultra-Low Flush</i>
<i>UPA</i>	<i>Sacramento County's Urban Policy Area</i>
<i>USACE</i>	<i>U.S. Army Corps of Engineers</i>
<i>USBR</i>	<i>United States Bureau of Reclamation</i>
<i>WF</i>	<i>Water Forum</i>
<i>WFA</i>	<i>Water Forum Agreement</i>

<i>WSIP</i>	<i>Water Supply Infrastructure Plan</i>
<i>WSMP</i>	<i>Zone 40 Water Supply Master Plan</i>
<i>WTP</i>	<i>Water Treatment Plant</i>
<i>Z40E1</i>	<i>Expanded Zone 40 Area No. 1</i>
<i>Z40E2</i>	<i>Expanded Zone 40 Area No. 2</i>
<i>Z40E3</i>	<i>Expanded Zone 40 Area No. 3</i>
<i>Zone 40</i>	<i>area of Laguna, Vineyard, and Elk Grove communities (Laguna/Vineyard Service Area)</i>
<i>1987 Plan</i>	<i>1987 Zone 40 Water Supply Master Plan</i>

SECTION 1

Introduction





This section describes the purpose of this Water Supply Master Plan (WSMP), and provides background information on the formation of the Sacramento County Water Agency (SCWA) and the formation and purpose of a special benefit zone within SCWA known as Zone 40. A description of the Water Forum Agreement (WFA) is also provided. Finally, the objective and scope of the WSMP is provided.

INTRODUCTION

1.1 PURPOSE OF THE ZONE 40 WATER SUPPLY MASTER PLAN

The Zone 40 WSMP has been prepared by the SCWA to provide a flexible program of water management alternatives that can be implemented and revised, if necessary, as the availability and feasibility of water supply sources change in the future. The WSMP also reflects changes from the 1987 Zone 40 Water Supply Master Plan (James Montgomery, February 1987) (1987 Plan) in the pattern of growth in water demands, water quality treatment requirements, expansion of the original service area, and in the availability of potential sources of surface water supplies.

The WSMP also has as its foundation, the WFA (Water Forum, January 2000) and its two coequal objectives: (1) to provide a reliable and safe water supply for the region's economic health and planned development through the year 2030, and (2) to preserve the fishery, wildlife, recreational, and aesthetic values of the lower American River.

This Plan describes the studies performed and presents findings, conclusions, and recommendations to meet future water demands in Zone 40 through the year 2030. The plan consists of eight sections and seven appendices, and provides references to supplementary and supporting documents that are incorporated by reference and are available for review at SCWA. **Section 1** provides general background information. Assessment of future water needs, including projected demands, demand management, and the availability of groundwater supplies, is presented in **Sections 2 and 3**. **Sections 4 through 6** define and evaluate alternative water management options, including treatment requirements, availability of surface water supplies, supply and capital facility components, and the evaluation and selection of the recommended alternative. Finally, **Sections 7 and 8** provide a financial analysis and implementation plan, including program management recommendations.



1.2 BACKGROUND

This section describes the formation of SCWA and the creation and function of Zone 40, provides a summary of the 1987 Plan, discusses the WFA, describes the 2030 study area, and notes changed conditions that have contributed to the need for this WSMP.

1.2.1 SCWA and Zone 40

SCWA was formed in 1952 by a special legislative act of the State of California (the Sacramento County Water Agency Act [Agency Act]). SCWA's purposes include but are not limited to the following:

- Making water available for any beneficial use of lands and inhabitants; and
- Producing, storing, transmitting, and distributing groundwater

SCWA is governed by a Board of Directors (ex officio, the Sacramento County Water Agency Board of Directors [Board]). Under the Agency Act, the Board may contract with the federal government under reclamation laws with the same powers as irrigation districts, and with the State of California and federal government with respect to the purchase, sale, and acquisition of water. SCWA may also own, construct and operate any required capital facilities.

Zone 40 was created by SCWA Resolution No. 663 in May 1985, which describes the exact boundaries of the zone, and defines the projects to be undertaken as "... the acquisition, construction, maintenance and operation of facilities for the production, conservation, transmittal, distribution and sale of ground or surface water or both for the present and future beneficial use of the lands or inhabitants within the zone."

SCWA Ordinance No. 18, adopted in 1986, empowered SCWA to establish fees, charges, credits, and regulations for the wholesale supply of water to zones within SCWA. A water supply master plan is required by this ordinance.

The boundaries (see **Figure 1-1**) and scope of Zone 40's activities were expanded in April 1999 by Resolution WA-2331. Zone 40's scope now includes the use of recycled water in conjunction with surface and groundwater, "for the present or future beneficial use or uses of the lands or inhabitants within the Zone."

¹ *Water Forum Agreement, Section 1(A)*

1.2.2 Summary of the 1987 Plan

The 1987 Plan identified water demands, sources of water supply, groundwater availability, water quality, and facility requirements to meet projected demand. The primary objective of the 1987 Plan was the development of a long-term plan for meeting future water needs in the developing Laguna and Vineyard areas in a way that would protect the reliability of the groundwater source.

The 1987 Plan described a conjunctive use water plan to meet 2005 maximum day water supply needs consisting of groundwater (20 million gallons per day [mgd]) and surface water (80 mgd). The 1987 Plan assumed that surface water would be obtained from the Central Valley Project (CVP) through a contract with the U.S. Bureau of Reclamation (Reclamation). The 1987 Plan identified the preferred treatment and conveyance method as the purchase of treatment capacity at the City of Sacramento's (City) E.A. Fairbairn Water Treatment Plant and recommended that SCWA enter into an agreement with the City to "wheel" the treated surface water through their system to Zone 40.

1.2.3 Water Forum Agreement

The Water Forum (WF) process brought together a diverse group of stakeholders that included water managers, business and agricultural leaders, environmentalists, citizen groups, and local governments to evaluate available water resources and the future water needs of the Sacramento metropolitan region. The coequal objectives of the WF are to: 1) provide a reliable and safe water supply for the region's economic health and planned development through the year 2030; and 2) preserve the fishery, wildlife, recreational, and aesthetic values of the lower American River¹. The first objective will be met by additional diversions of surface water, increased conjunctive use of surface water and groundwater, expanded water demand management programs, and recycled water. The second objective will be met by modifications to American River flow patterns in order to improve in-stream fish habitat.

Development of a WFA to meet the coequal objectives involved substantial scientific study, environmental analysis, and consensus-building with various stakeholders. The WFA is a comprehensive package of linked actions that, when implemented, are intended to successfully achieve the coequal objectives. These linked actions require the support of each stakeholder in the public policy decision-making process and through implementation in order to successfully achieve the coequal objectives.

These actions include adherence to an agreed upon long-term average annual limit (defined as the “sustainable yield”) for each of the three geographic sub-areas of the groundwater basin underlying Sacramento County (County): 131,000 acre-feet (AF) for the North Area (north of the American River); 273,000 AF for the Central Area (between the American and Cosumnes Rivers)²; and 115,000 AF for the Galt or South Area (south of the Cosumnes River). Any proposed water supply project must satisfy the groundwater conditions specified in the WFA for the 2030 projected level of development.

The WFA includes Purveyor Specific Agreements (PSA) that define the benefits each water purveyor will receive as a stakeholder and actions each must take to receive these benefits. PSAs for the City and the Sacramento Municipal Utility District (SMUD) also describe commitments by the City, SMUD, and SCWA to address issues related to wheeling and wholesaling of surface water, CVP water transfers, and dry year water supply. The County/SCWA PSA is included as **Appendix A**. A brief summary of SCWA’s PSA follows.

- SCWA is responsible for providing wholesale water to an area that includes the Laguna, Vineyard, Elk Grove and Rancho Cordova communities³ commonly referred to as Zone 40.
- SCWA will divert firm⁴ and intermittent⁵ surface water from at or near the mouth of the American River or from the Sacramento River. SCWA will conjunctively use groundwater and surface water to meet water system demands.
- A portion of Zone 40 is situated within the Place of Use (POU) for the City’s American River water entitlements (see **Figure 1-1**). It is assumed that these entitlements would be used to serve this area. Conditions for the use of this entitlement will be consistent with the conditions outlined in the City’s PSA⁶.
- All signatories to the WFA endorse SCWA’s PSA, which provides for the construction of SCWA’s surface water

and groundwater supply facilities. These include a surface water diversion structure at or near the mouth of the American River or from the Sacramento River, treatment plants, pumping stations, wells, storage facilities, and transmission pipelines⁷.

- Stakeholder support is contingent on project specific compliance with the California Environmental Quality Act (CEQA), and where applicable, the National Environmental Policy Act (NEPA), federal Endangered Species Act, and California Endangered Species Act⁸.

1.2.4 2030 Study Area

While much of Zone 40 still consists of rural land uses, (i.e., agricultural, agricultural/residential, and conservation reserve), urbanization has been occurring within the Cities of Elk Grove and Rancho Cordova, and in the Vineyard and Mather/Sunrise areas of unincorporated County. The 2030 study area consists of existing and developing industrial, commercial, office and residential land uses within these urbanizing areas. The 2030 study area is approximately 46,600 acres and is shown as the gray shaded area in **Figure 1-1**. This area consists of two geographically separate subareas of Zone 40 where urban water demand is expected to be concentrated in the next 25 years. Its boundaries generally coincide with the County’s Urban Policy Area (UPA), defined by the 1993 Sacramento County General Plan update (County General Plan) as the area within which urban development and provision of infrastructure are expected to occur within the planning horizon of the County General Plan (2024). The 2030 study area also includes approximately 4,800 acres in four small areas that are outside the UPA to account for growth contemplated in the WFA from 2024 to 2030.

Water demand is expected to be concentrated within the 2030 study area; however, developments can be proposed and approved anywhere within Zone 40 where they are consistent with the framework and requirements provided in the various County General Plans, Community Plans, Comprehensive Plans, Specific Plans, and zoning and subdivision ordinances.

² Water Forum Agreement Section 3 (VI) (B) (2), (3), & (4)

³ Water Forum Agreement, Section 5(I) Purveyor Specific Agreements, “County of Sacramento/Sacramento County Water Agency” (A), Introduction

⁴ The term “firm” is used for surface water supply contracts or water rights that yield significant quantities of water in dry and critical years.

⁵ The term “intermittent” is used for surface water applies that are available primarily in wet and normal years.

⁶ Water Forum Agreement, Section 5(I) Purveyor Specific Agreements, “City of Sacramento (D), Agreement for Meeting the City of Sacramento’s Water Supply Needs to the Year 2030

⁷ Water Forum Agreement, Section 5(I) “County of Sacramento/Sacramento County Water Agency” (E)(21)

⁸ Water Forum Agreement, Section 5(I) “County of Sacramento/Sacramento County Water Agency” (F)(3.a.)

Figure 1-1. Zone 40 and the 2030 Study Area

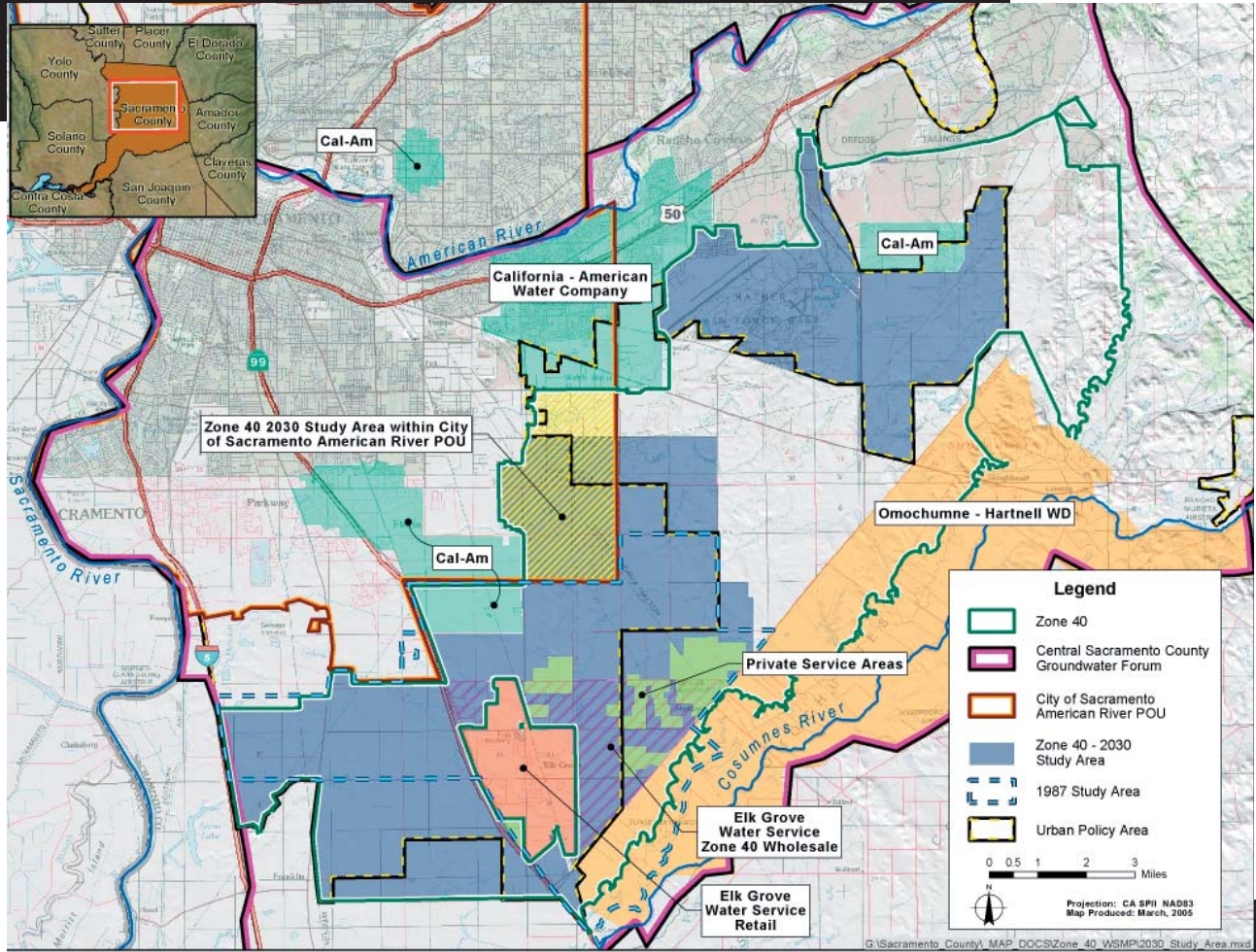


Figure 1-2. Specific Plan, Comprehensive Plan and Community Plan Areas

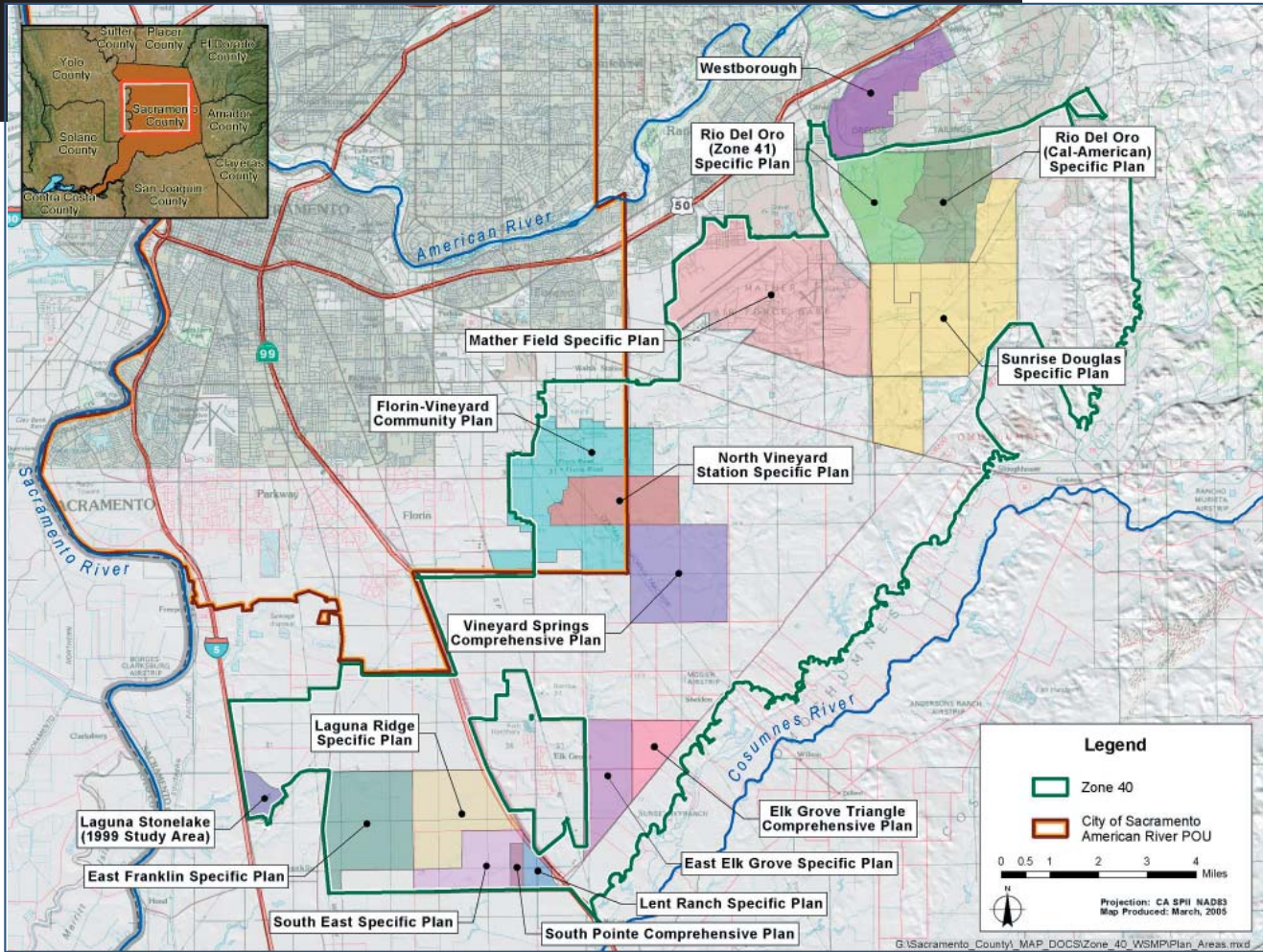


Figure 1-2 shows all approved and pending specific plan and community plan areas within Zone 40. Development patterns may ultimately be somewhat different than that assumed for estimating water demands; however, the total demand and the infrastructure needed to support it will not vary substantially from what is projected in this plan. Any significant variations due to changes in supplies, County General Plan amendments, annexations, incorporations, or major programs contemplated in this plan will be treated through formal updates or amendments to this plan.

1.2.5 Other Water Purveyors

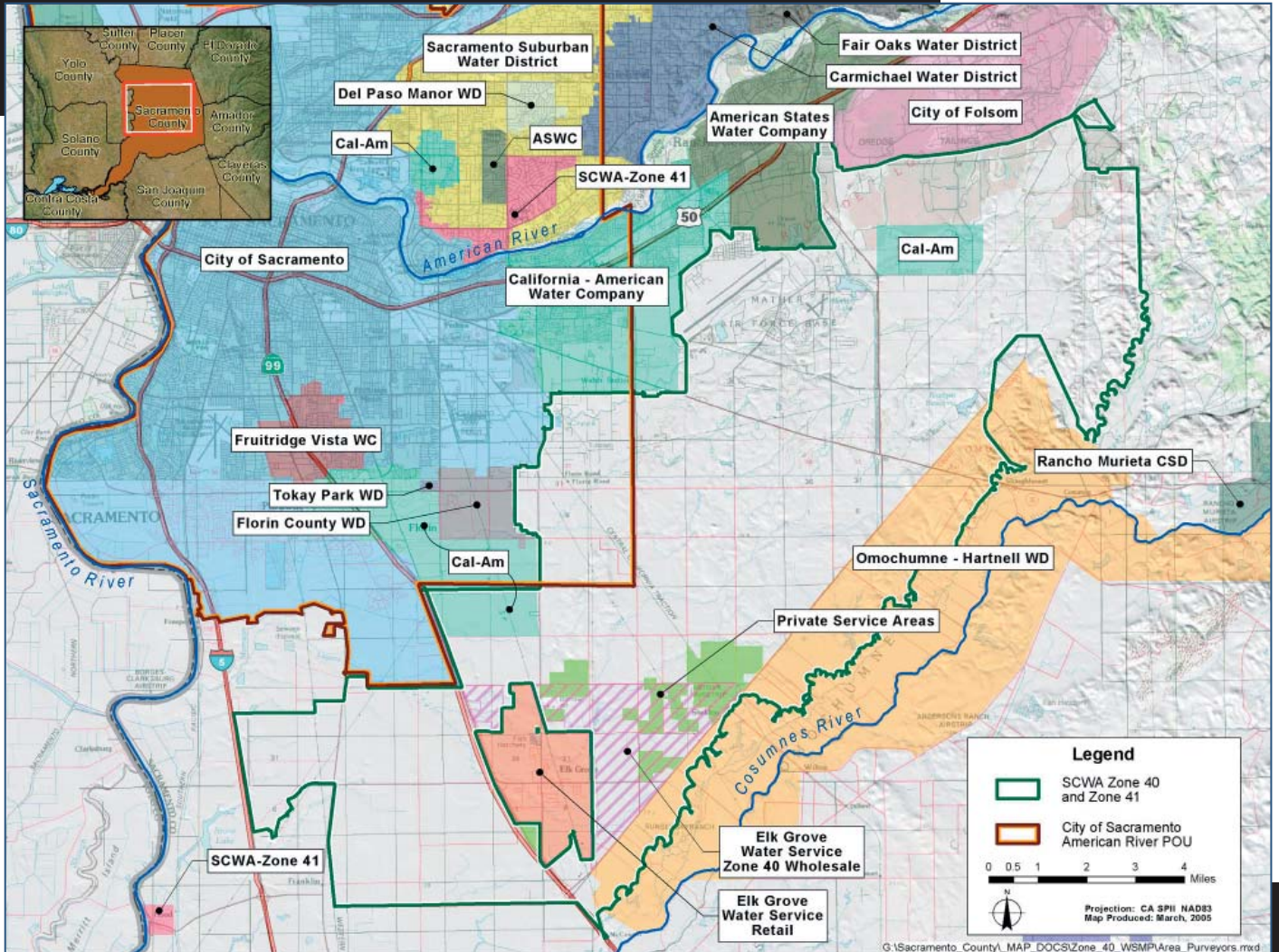
Three retail water purveyors provide service within the boundaries of Zone 40: SCWA Zone 41 (formerly Sacramento County Water Maintenance District), Florin Resource Conservation District/Elk Grove Water Service (FRCD/EGWS), and the California-American Water Company (Cal-Am). Within the 2030 Study Area, SCWA provides wholesale water to a portion of the FRCD/EGWS service area (Zone 40 Wholesale/EGWS Retail Area) under the terms of the First Amended and Restated Master Water Agreement (**Appendix B**). For the purpose of this plan, it has been assumed that Cal-Am will purchase wholesale water supplies from SCWA to serve its Security Park franchise area located in the northern portion of Zone 40. The service areas of these purveyors are shown on **Figure 1-3**.

A portion of the Omochumne-Hartnell Water District is located within the boundaries of Zone 40 between Grant Line Road and the 100-year flood plain of the Cosumnes River. Irrigation water from the Cosumnes River is supplied by the district to adjacent agricultural users. Periodically, untreated water has been diverted from the Folsom South Canal into the Cosumnes River for use by irrigators.

1.2.6 Need for A Master Plan Update

The 1987 Plan's preferred alternative was based on a set of assumptions regarding urban development patterns, water use demand patterns, groundwater availability, and surface water availability that have changed since the adoption of that plan. The most significant changes to those assumptions resulted from a major modification of CVP contracting policy and from adoption of the County General Plan, which substantially increased the area designated for urban growth in the County. Zone 40's boundaries were modified to reflect these changes, resulting in an expansion of the Zone from 17,200 acres to 86,000 acres. Assumptions of the 1987 Plan were also made obsolete by the WFA that included estimates of sustainable groundwater yield supported by more extensive hydrologic and hydrogeologic information for the groundwater basin underlying Zone 40. Changed conditions regarding groundwater contamination and remediation efforts now underway in the County also affect water planning for Zone 40. Remediation efforts currently underway by Aerojet-General Corporation (Aerojet) and Boeing (Boeing or McDonnell-Douglas) have resulted in the East Sacramento County Replacement Water Supply Project.

Figure 1-3. Water Purveyor Service Areas



1.3 OBJECTIVES OF THE WSMP

The overall objective of this study is to develop a WSMP to meet future water demands through a conjunctive use program of groundwater, surface water, and recycled water supplies. Specific objectives of the studies undertaken for the WSMP are described below:

- Identify assumptions and recommendations from the 1987 Plan that are no longer appropriate;
- Develop a set of water supply alternatives that provide a long-term balance between water demands and available supplies that include demand management, groundwater (including groundwater from the East Sacramento County Replacement Water Supply Project), surface water, and recycled water as the building blocks for water management alternatives;
- Evaluate the engineering, institutional, social, financial, and environmental aspects associated with implementing each of the potential water management alternatives;
- Recommend a water management alternative that is flexible and can be modified as situations change and additional information becomes available;
- Identify an appropriate and flexible means of financing the recommended water management alternative;
- Provide a foundation on which to develop a Water Supply Infrastructure Plan (WSIP) to base decisions regarding the acquisition, construction, operation and maintenance of facilities required for the production, transmission, distribution, sale, and demand management of water; and
- Maintain consistency with the adopted Zone 40 Groundwater Management Plan and the proposed Central Sacramento County Groundwater Basin Groundwater Management Plan.

1.4 SCOPE OF THE WSMP

The elements of this WSMP are as follows:

- Define the WSMP's objectives and the activities;
- Define the programs and authorities of other agencies relevant to Zone 40's water supply;
- Analyze existing conditions including existing land and water use in and adjacent to Zone 40, existing groundwater yield, and source water quality;
- Estimate future water demands, including daily, seasonal, and hydrological variations, and associated supply capacity requirements;
- Identify and evaluate future water sources, including demand management, recycled water, groundwater, and surface water sources;
- Identify and evaluate water quality and treatment needs, including a review of existing and anticipated drinking water standards and their potential impact on treatment needs and costs;
- Identify and evaluate water supply alternatives that will provide a sufficient quantity of water to meet the ultimate demand of the 2030 study area, including definition of evaluation criteria;
- Recommend a preferred alternative; and
- Develop a financing plan and water management program to support implementation of the preferred alternative water supply program.

SECTION 2

Water Demands





This section considers the existing and future water demand estimates for purposes of evaluating the timing of capital projects and assessing operational scenarios using groundwater, surface water, and recycled water.

WATER DEMANDS

2.1 INTRODUCTION

The determination of future water demands is necessary to establish the amount and timing of water needed to serve the 2030 study area. Facility sizing and operation is directly influenced by projections of water demands. This section describes the methodology and background information used to estimate water demands within the study area.

2.2 1987 WATER SUPPLY MASTER PLAN DEMAND PROJECTION

The 1987 Plan planning period extended from 1986 to 2005, which was the estimated ultimate build-out period for the original 17,195 acres within Zone 40 (2005 study area). Land use projections were based on Sacramento County community plans, zoning maps, and new land development proposals. Growth rates were estimated based on the Sacramento County Planning Department's five year increment population projections. Total service area demand was estimated by applying a unit demand factor of 3.3 acre-feet per acre per year (AF/Ac/Yr) (340 gallons per capita per day) to all projected land uses (i.e., agricultural, and municipal and industrial [M&I]) in the 2005 study area. This unit demand factor was recommended for long-range water supply planning by the State of California Department of Water Resources (DWR) in DWR Bulletin No. 104-71. The 1987 Plan estimated maximum day water demand at 100 mgd for build-out of the "near term service area" and 112.8 mgd for the 2005 study area.



2.3 WATER FORUM DEMAND PROJECTION

The WFA's projection of future water demands is based on the report, *Estimate of Annual Water Demand within the Sacramento County-Wide Area* (Boyle Engineering Corporation, 1995) (Boyle Report). A discussion of the methodology used to determine WF demands is included in the Draft Environmental Impact Report (DEIR) for the WF Proposal (EDAW/Surface Water Resources, Inc. (SWRI), 1999) (WF DEIR). These documents are incorporated herein by reference and are available for review at SCWA.

The County General Plan defines a UPA boundary that represents near term build-out (2024, est.) and an Urban Services Area boundary that represents ultimate build-out (2050, est.). The WFA estimates water demands for the year 2030, that is, water demands for a projected level of development equal to build-out of the Urban Policy Area, (2024) plus an increment of development in the Urban Services Area (see **Figure 1-1**).

The WFA defines a number of "sub-regions" within Sacramento County (see WFA, p. 346), and year 2030 water demands for each are estimated based on projected land use. One such sub-region is the South County M&I Users Group, which includes approximately 42,600 acres of Zone 40. Approximately 4,300 acres of Zone 40 are also located within the City South POU sub-region. The City South POU delineates a portion of the American River POU south of the American River, which is located outside the City limits (**Figure 2-1**).

2.4 WATER SUPPLY MASTER PLAN DEMAND PROJECTION

The WFA's projected urban water demand for the South County M&I Users Group sub-basin is based on unit water demand factor estimates from the Boyle Report. Unit water demand factor projections in the WSMP are based on the Boyle Report methodology. For urbanized areas, the Boyle Report factors were improved based on more recent water use data (See **Appendix C** for a white paper report - Formulation of Unit Water Demands with Water Conservation).

Land use data based on DWR's 2000 Land Use Survey (**Figure 2-2**) was used to estimate existing water demands within the 2030 study area as shown in **Table 2-1**. Existing unit water demand factors assume a 12 percent level of water conservation. Current water demands are estimated at 24,900 AF per year (AF/year).

Water demands are projected to increase linearly from current levels to build-out of the County General Plan in 2024 and at a slightly reduced rate to 2030 as shown in **Figure 2-4**. The 2030 water demand projections are based on land uses identified in both the County General Plan and the City of Elk Grove General Plan (City of Elk Grove, 2003) (**Figure 2-3**) and include a conservation demand reduction factor of 25.6 percent applied to the revised Boyle Report unit water demand factor estimates. The increment of water demand from 2024 to 2030 is calculated based on extrapolating urban land use areas based on the expected population growth from 2024 to 2030. Those areas of the South County M&I Users Group and City South POU that are outside the 2030 study area are not included in the water demand estimates and amendments made to the County General Plan have been factored into the projection of future land uses. The resulting inventory of land use types, acreage, unit water demand factors and projected water demands is shown in **Table 2-2**. The projected year 2030 Zone 40 annual water demand is 113,064 AF/year.

Figure 2-1. South County M&I Users Group and City South POU

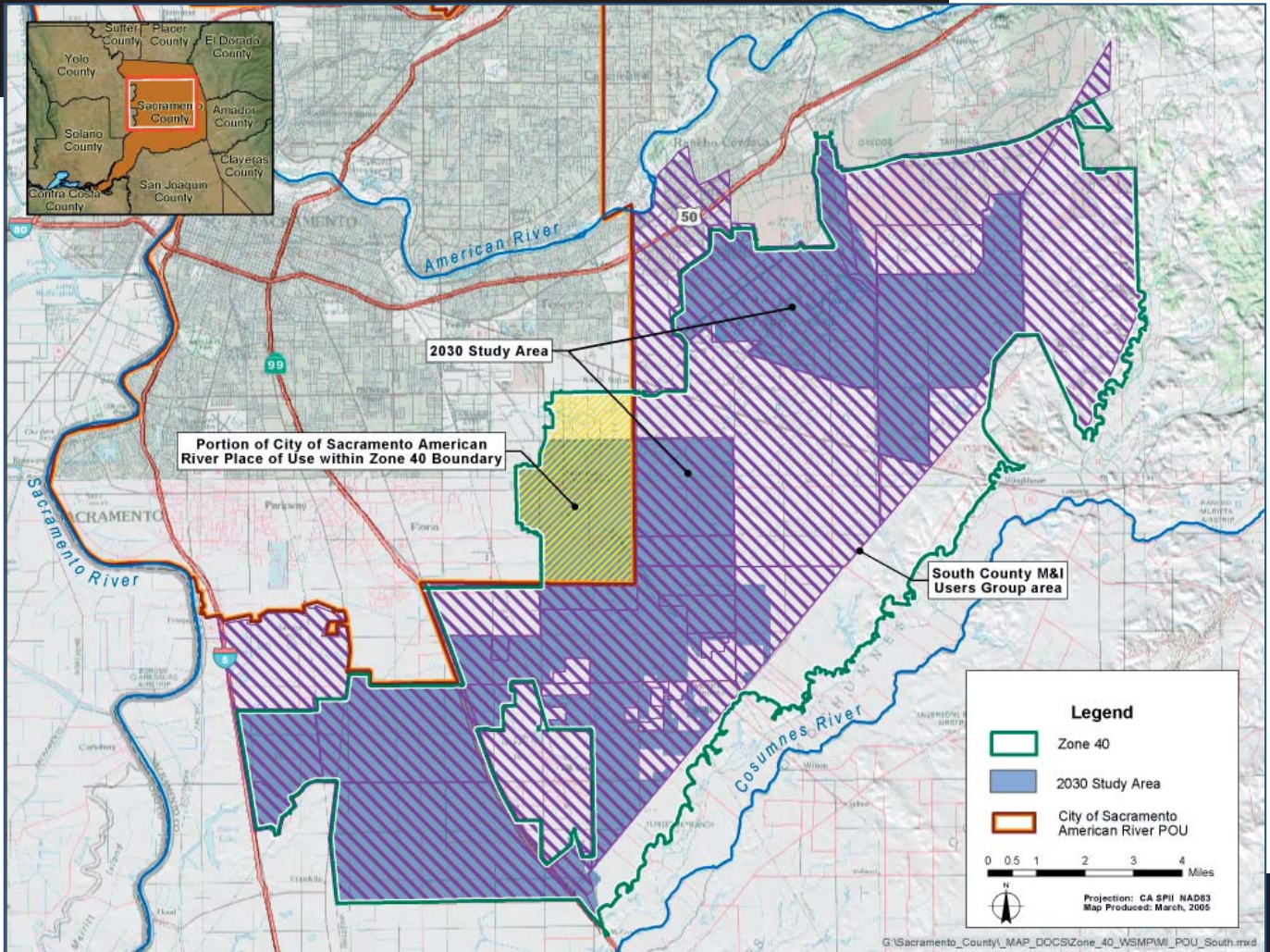


Table 2-1. Zone 40 Year 2000 Water Demands

<i>Land Use Category</i>	<i>Year 2000¹</i>		
	<i>Unit Water Demand Factors^{2,3} (AF/Ac/Yr)</i>	<i>Land Use (Acres)</i>	<i>Water Demand (AF/year)</i>
Rural Estates	1.57	304	477
Single Family	3.40	3,387	11,515
Multi-Family – Low Density	4.36	285	1,242
Multi-Family - High Density	4.85	0	0
Commercial	3.24	254	821
Industrial	3.19	1,257	4,010
Industrial – Unutilized	0	0	0
Public	1.22	692	844
Public Recreation	4.08	400	1,630
Mixed Land Use	2.95	840	2,479
DEVELOPED LAND USE		7,418	23,020
Right-of-Way	0.25	726	181
WATER USE SUBTOTAL			23,201
Water System Losses (7.5%)			1,740
ZONE 40 WATER PRODUCTION			24,941
Urban and rural areas not currently being served by Zone 40		5,127	
Vacant		27,583	
Agriculture		5,766	
TOTAL LAND AND WATER USE		46,620	24,941

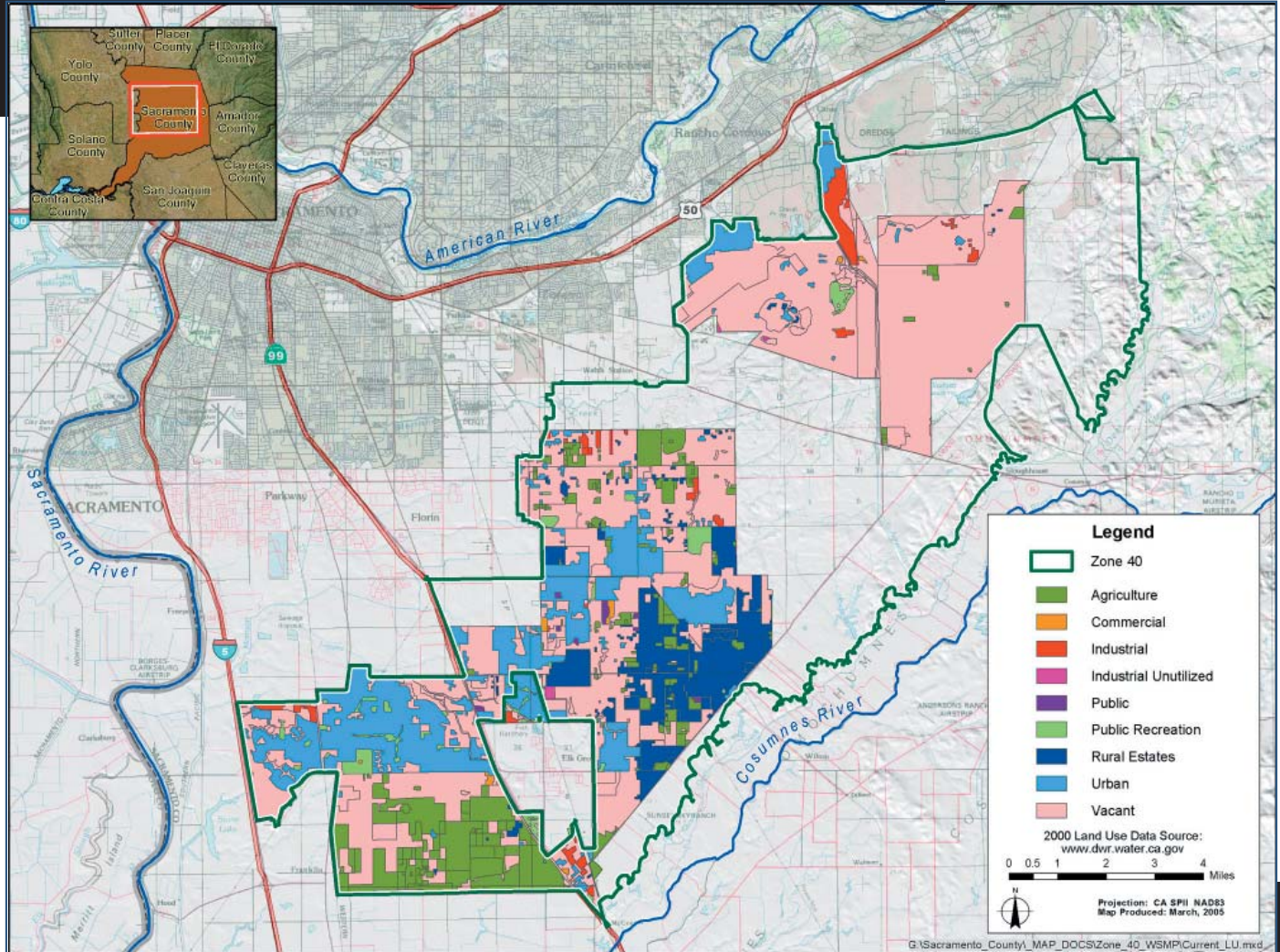
- Notes:
1. Year 2000 Land Use Survey, California State Department of Water Resources (www.dwr.water.ca.gov). Urban land uses only reflect areas currently being served by Zone 40.
 2. Boyle unit water demand factors have been adjusted to reflect more recent water use data.
 3. Unit water demand factors are normalized to account for hydrologic year differences, and reflect an estimated 12 percent level of water demand management.

Table 2-2. Zone 40 Year 2030 Water Demands

<i>Land Use Category</i>	<i>Water Forum Build-Out¹</i>		
	<i>Unit Water Demand Factors^{2,3} (AF/Ac/Yr)</i>	<i>Land Use (Acres)</i>	<i>Water Demand (AF/year)</i>
Rural Estates	1.33	718	955
Single Family	2.89	14,867	42,966
Multi-Family - Low Density	3.70	1,173	4,340
Multi-Family - High Density	4.12	0	0
Commercial	2.75	1,042	2,866
Industrial	2.71	2,395	6,490
Industrial – Unutilized	0	1,463	0
Public	1.04	4,349	4,523
Public Recreation	3.46	2,865	9,913
Mixed Land Use	2.51	12,985	32,591
<i>DEVELOPED LAND USE</i>		<i>41,857</i>	<i>104,645</i>
Right-of-Way	0.21	2,526	530
WATER USE SUBTOTAL			105,175
Water System Losses (7.5%)			7,888
<i>WATER PRODUCTION</i>			<i>113,064</i>
Vacant		2,225	
Agriculture		12	
<i>TOTAL LAND AND WATER USE</i>		<i>46,620</i>	<i>113,064</i>

- Notes:
1. 1993 Sacramento County General Plan plus General Plan Amendments as of 2002 and 2003 City of Elk Grove General Plan.
 2. Boyle unit water demand factors have been adjusted to reflect more recent water use data.
 3. Unit water demand factors are normalized to account for hydrologic year differences, and reflect a 25.6 percent level of water demand management.

Figure 2-2. Current (2000) Zone 40 Land Use Within the 2030 Study Area



2.5 DEMAND MANAGEMENT/WATER CONSERVATION

As a signatory to the WFA and as a Reclamation CVP water contractor, SCWA is committed to implement 16 Water Conservation Best Management Practices (BMP) as defined in the County of Sacramento Water Forum Water Conservation Plan, pages 118–129 of Appendix J of the WFA (included in this document as **Appendix D**). The Boyle Report assumed that implementation of the BMPs justified a water demand reduction factor of 8 percent at County General Plan build-out (2024) and 11.9 percent at ultimate build-out (2050). Boyle re-examined these factors for the WF (see **Appendix C**) in light of an expanded list of BMPs (most notably the provision for meter retrofit and conservation pricing) and determined that a year 2030 demand reduction factor of 25.6 percent relative to the 1990 baseline water demand was appropriate.

2.6 DEMAND MODELING

Modeling efforts in support of the WSMP and WSMP related activities (e.g., the Sacramento River diversion and water treatment plant [WTP]), have been completed using demands that vary slightly from **Table 2-2**. The purpose of this section is to provide some discussion on the reason for these differences. All studies begin with the build-out demand of 113,064 AF/year. A reduction in demand is realized through the use of recycled water⁹ from the Sacramento Regional County Sanitation District (SRCSD) (approximately 4,400 AF/year) which reduces potable water demands to 108,664 AF/year.

An additional increment of demand is included in the modeling studies to reflect Zone 40's obligations under the East Sacramento Replacement Water Supply Project to reuse remediated groundwater and the provision of dry year water supplies to SMUD in accordance with SMUD's PSA in the WFA. A reduction in the amount of dry year water to be delivered is possible; however, for the purpose of this report the maximum SMUD supply to be delivered by Zone 40 in critical and dry years is 10,000 AF/year when unimpaired American River inflows into Folsom Reservoir are less than 400,000 AF/year. This amount decreases linearly to 0 AF/year when unimpaired flows are greater than 950,000 AF/year. In 2030, the water demand in a given year is dependent on Zone 40's obligation to meet SMUD's dry year needs. An exceedance plot of water demands over a 70-year historical period of wet and dry years is provided in **Figure 2-5** to show the modified water demand used for purposes of water facility planning. Reading from **Figure 2-5**, 35% of the time demands could be higher than 108,664 AF/year. In 2% of the years, demands could be as high as approximately 118,000 AF/year.

⁹Wastewater treated to tertiary standards and delivered to Zone 40 constructed infrastructure for conveyance to identified non-potable water users such as parks, commercial landscaping, and school turf areas.

Figure 2-4. Water Demand Projection over Planning Period

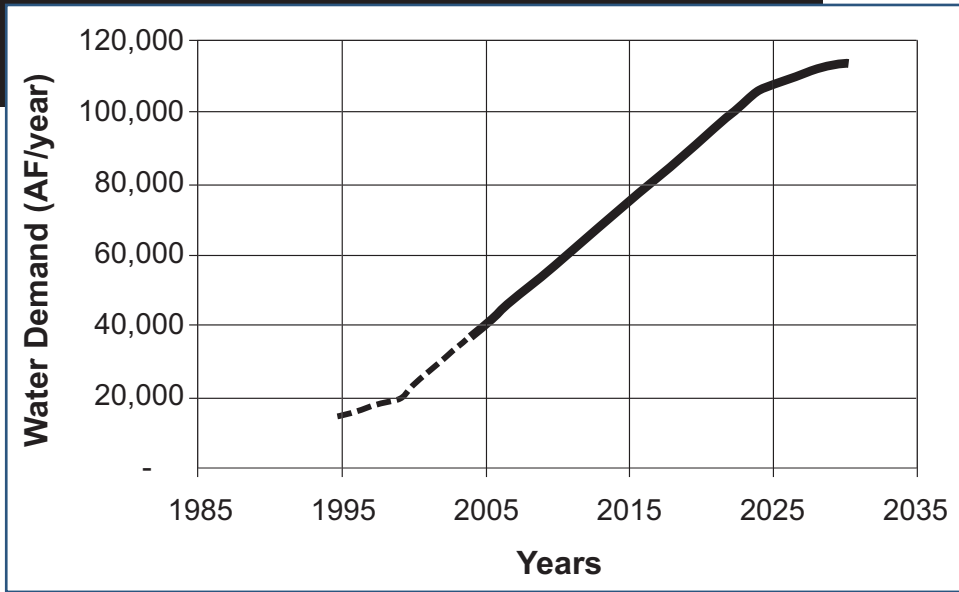
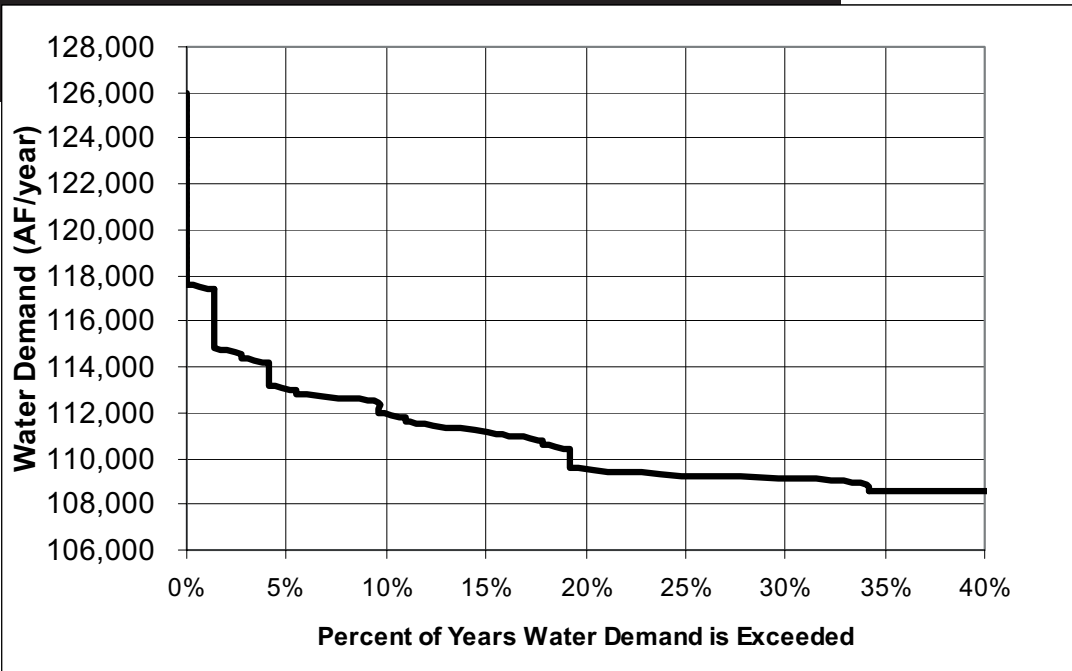


Figure 2-5. Modified Zone 40 Water Demands Used for Planning of Water Facilities



This section briefly describes the aquifer system underlying Zone 40 and then discusses groundwater availability. Technical studies completed by SCWA as part of the WF Process have been compiled and are now part of the “Baseline Conditions for Groundwater Yield Analysis” (Montgomery Watson, 1997) (Baseline Report). The WF PSAs and the Baseline Report were used in the development of this section and are incorporated herein by reference.

GROUNDWATER AVAILABILITY

3.1 GROUNDWATER BASIN

The WF defined three groundwater sub-basins underlying Sacramento County based on the hydraulic boundaries of each of the river sources. **Figure 3-1** illustrates the groundwater elevation contours for Spring 2003 and shows the three sub-basins and their respective cones of depression. Zone 40 lies entirely within the Central Sacramento County Groundwater Basin (Central Basin).

Groundwater in the Central Basin is generally classified as occurring in a shallow aquifer zone (Laguna or Modesto Formation) or in an underlying deeper aquifer zone (Mehrten Formation). Within Zone 40 the shallow aquifer extends to approximately 200 to 300 feet below the ground surface and, in general, the water quality in this zone is considered to be good except for the occurrence of low levels of arsenic in some locations. The shallow aquifer is typically targeted for private domestic wells requiring no treatment unless naturally occurring arsenic is encountered.

The deep aquifer is separated from the shallow aquifer by a discontinuous clay layer that serves as a semi-confining layer for the deep aquifer. The base of the deep aquifer averages approximately 1,400 feet below the ground surface. Water at the base of the deep aquifer typically has higher concentrations of total dissolved solids (TDS) or salinity. Iron and manganese are typically found in the deep aquifer requiring treatment to secondary standards. Groundwater used in Zone 40 is supplied from both the shallow and deeper aquifer systems.

Groundwater in Central Sacramento County moves from sources of recharge to areas of discharge. Recharge to the local aquifer system occurs along active river and stream channels where extensive sand and gravel deposits exist, particularly along the American, Cosumnes, and Sacramento River channels. Additional recharge occurs along the eastern boundary of Sacramento County at the transition point from the consolidated rocks of the Sierra Nevada to the alluvial deposited basin sediments. This typically occurs through fractured granitic rock that makes up the Sierra Nevada foothills. Other sources of recharge within the areas include deep percolation from applied surface water, precipitation, and small streams.



3.1.2 Sustainable Yield

The WFA defines the allowable long-term average volume of groundwater that can be pumped from each sub-basin as the sustainable yield. In the process of making this determination, the WF recognized that the sustainable yield is dependent on a number of factors including the desired groundwater levels to be maintained. The impacts associated with maintaining groundwater at lower levels may include:

- Increased pumping costs (WF Environmental Impact Report (EIR), Section 4.2-4);
- In-migration of lower-quality water¹⁰ from the deep aquifer system (WF EIR, Section 4.2-1);
- Dewatering existing wells (WF EIR, Section 4.2-4);
- Land subsidence (WF EIR, Section 4.2-3); and
- Increased rate of migration from localized sources of groundwater contamination (WF EIR, Section 4.2-2).

The WF also recognized that lower groundwater levels may impact stream flows and groundwater elevations in adjacent areas.

The Baseline Report provided the basis for a negotiated sustainable yield for each of Sacramento County's groundwater sub-basins. Considering the above factors, and based on negotiated levels of acceptable impacts associated with operating the sub-basin at a specified extraction amount, the WF defined a long-term sustainable average annual yield of 273,000 AF for the Central Basin. At this level of production, modeling performed in the Baseline Report predicted that groundwater levels at the Elk Grove cone of depression would stabilize at approximately 50 feet below their 1990 level.

3.2 CONJUNCTIVE USE

The WF has defined conjunctive use as, “the planned joint use of surface and groundwater to improve overall water supply reliability.”¹¹ Since its formation, Zone 40 has had as its goal the development of a conjunctive use water supply system. The 1987 Plan included surface water from the American River as its primary source of supply with groundwater playing a lesser role in meeting overall demands. As a result of the WF process, greater certainty was provided relative to the availability of surface water supplies, this increased the surity that a conjunctive use program could be implemented.

SCWA's PSA states that groundwater will be used on a conjunctive use basis by the South County M&I Users Group.

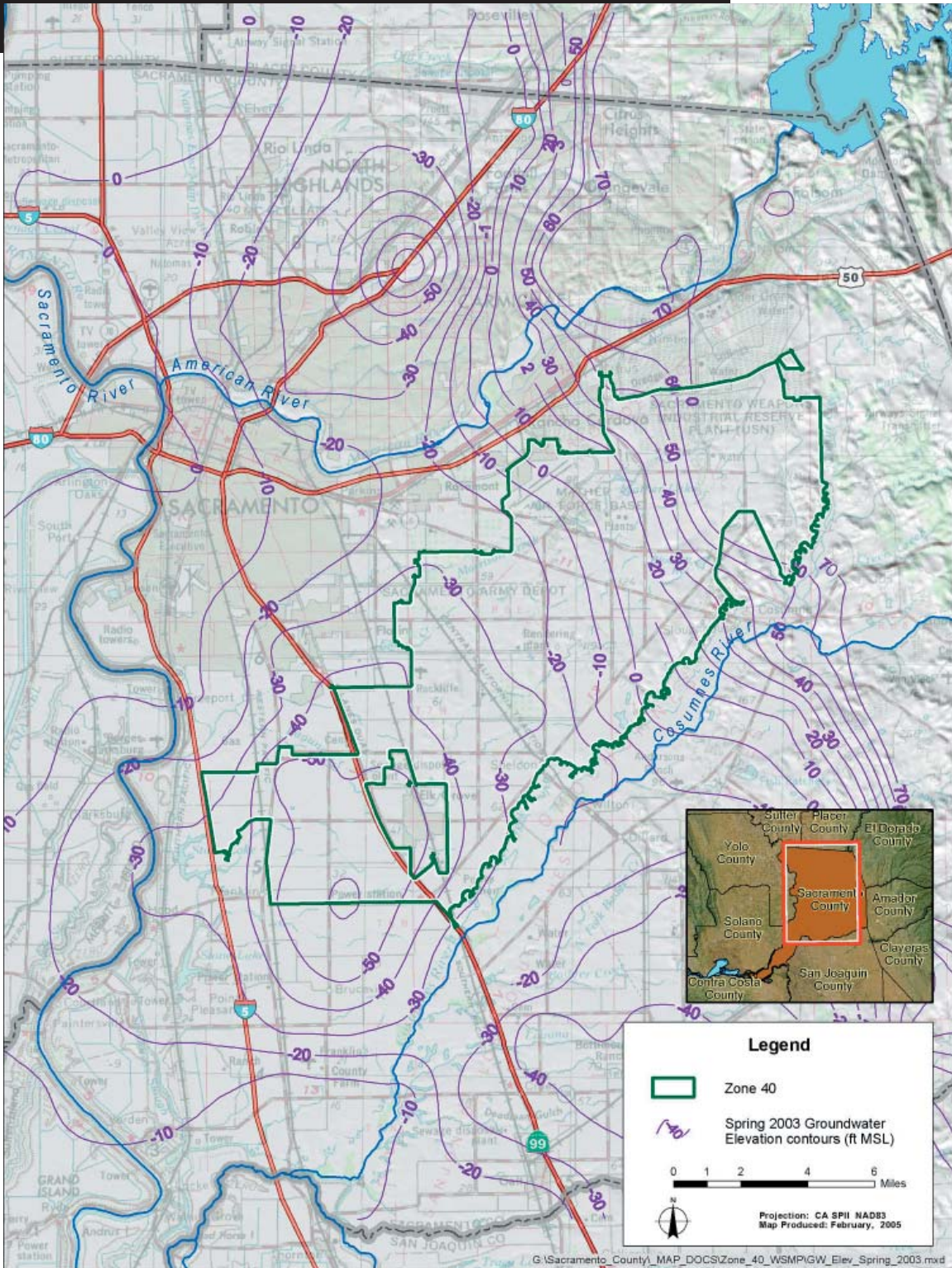
SCWA started surface water deliveries to Zone 40 in 1995 through a contract with Browns Valley Irrigation District. In 1999, SCWA began taking delivery of their CVP contract water through a long-term wheeling agreement with the City. Through the WSMP, SCWA will continue to move forward with a conjunctive use program that will meet projected water needs through the year 2030. A more complete description of the operational parameters of the conjunctive use program can be found in **Appendix E**.

¹⁰ Lower quality water is defined as water with higher concentrations of iron, manganese, arsenic, and total dissolved solids.

¹¹ Water Forum Agreement, Section 3(vi)(B)(1)

¹² The 103,000 AF is based on a reconciliation document prepared in October 2001. The 103,064 AF plus the portion of Zone 40 demands within the City's POU of approximately 10,000 AF supports the total of 113,064 AF as shown in Table 2-2.

Figure 3-1. Spring 2003 Groundwater Elevation Contours



3.3 GROUNDWATER DEMANDS

3.3.1 SCWA's Purveyor Specific Agreement

Section D of SCWA's PSA states:

“GROUNDWATER WILL BE USED IN A CONJUNCTIVE USE BASIS BY THE SOUTH COUNTY M&I USERS GROUP WITH A TOTAL 2030 DEMAND OF 117,600 AF. THE SOUTH COUNTY M&I USERS GROUP ALSO INCLUDES A PORTION OF CITIZENS UTILITIES COMPANY [currently known as Californian-American Water Company or Cal-Am] AND THE ELK GROVE WATER WORKS [Currently known as the Florin Resource Conservation District/Elk Grove Water Service or FRCD/EGWS].”

“THE AMOUNT OF GROUNDWATER USED [BY THE SOUTH COUNTY M&I USERS GROUP] WILL VARY FROM APPROXIMATELY 95,100 AF IN THE DRIEST YEARS DECREASING TO APPROXIMATELY 34,000 AF IN THE WET YEARS.”

Figure 2-1 shows the relationship of Zone 40 to the South County M&I Users Group.

In order to determine groundwater demands in the 2030 study area, it is necessary to separate Zone 40 demands from those of the South County M&I User's Group. Based on the WF water demand factors and estimated areas, the Zone 40 portion of the South County M&I User's Group 117,600 AF amounts to approximately 103,000 AF¹².

As stated previously, SCWA's WF PSA requires that groundwater be used conjunctively with surface water supplies. In Zone 40's conjunctive use program, the difference between demand and the amount of surface water and recycled water available in a given year would be supplied by groundwater. In critically dry years, CVP surface water supplies (Public Law [PL] 101-514 and SMUD surface water contracts) could be cut back as much as 25 percent, and intermittent water would be cut back as much as 100 percent. With firm supplies of 9,300 AF/year from the City for the portion of the 2030 study area in the American River POU and 4,400 AF/year of recycled water from the SRCSD, the dry year groundwater demand would be approximately 69,900 AF/year for Zone 40.

3.3.2 SMUD's Purveyor Specific Agreement

Section D of SMUD's PSA states:

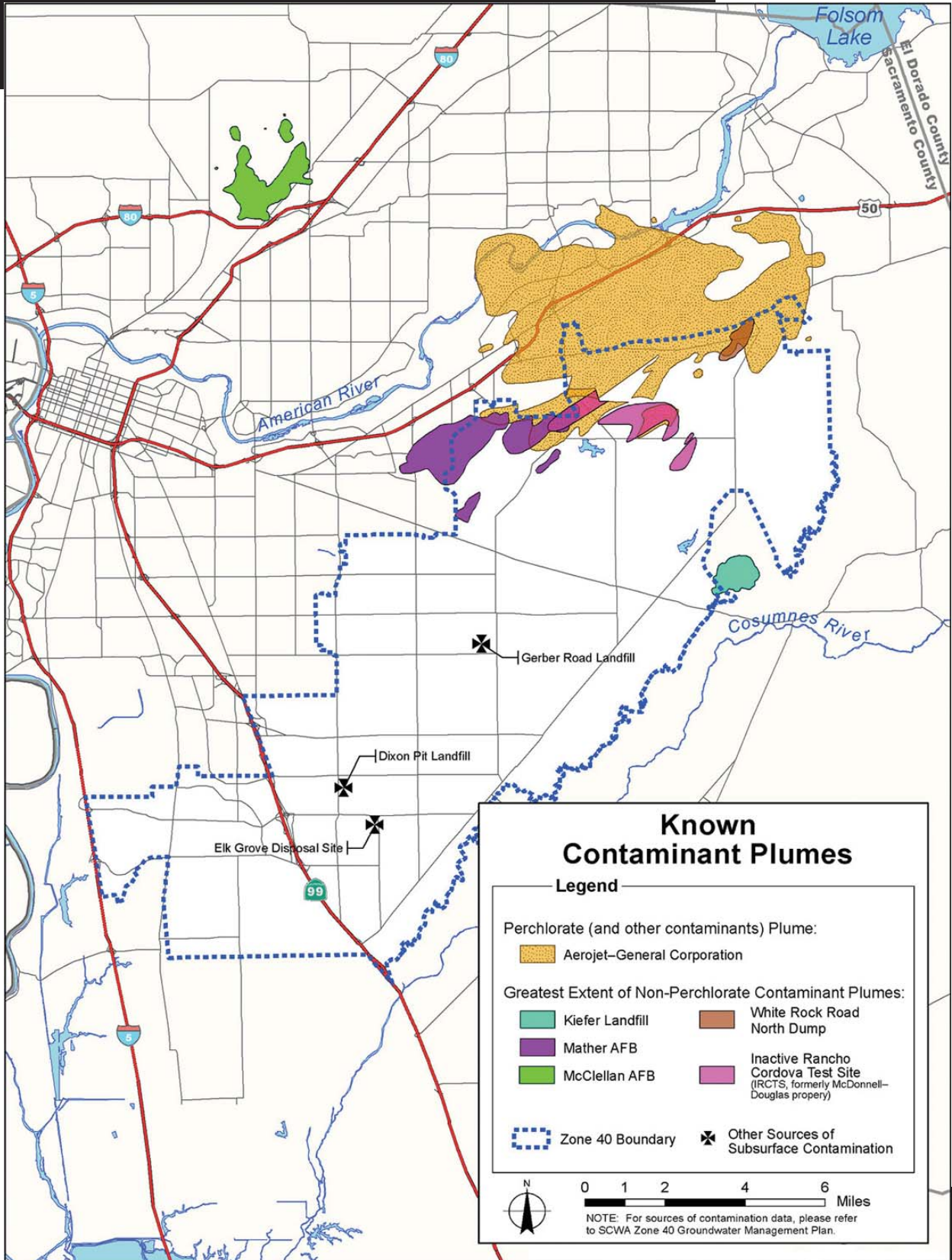
In drier years, SMUD will divert and use a decreasing amount of surface water from 30,000 AF to 15,000 AF in proportion to the decrease in unimpaired inflow to Folsom Reservoir. During drier years SMUD will make all reasonable efforts to reduce their demand by up to 5,000 AF in proportion to the unimpaired inflow into Folsom Reservoir and use groundwater to meet their remaining demands.

In the driest years, SMUD will reduce their diversion to 15,000 AF, equivalent to their baseline amount. During the driest years, SMUD will accomplish this reduction to baseline by making all reasonable efforts to reduce their demand by 5,000 AF and use groundwater to meet their remaining demands.

Provision of a groundwater supply and delivery from Sacramento County groundwater facilities will be paid for by SMUD from fees paid by the County of Sacramento to SMUD for the SMUD 2 Assignment. Construction of these facilities may be staged to match SMUD water demand above the baseline.

The implication of SMUD's PSA on Zone 40 effectively increases the need for water during the dry years to make up for any water needed by SMUD through Zone 40 facilities. A discussion of this is included in **Section 2.6**.

Figure 3-2. Locations of Contaminant Plumes



3.4 GROUNDWATER CONTAMINATION

Within Zone 40 groundwater is pumped, for the most part, throughout the southern and central portions of the zone (east of Interstate 5 to south of Elder Creek Road and west of Excelsior Road in the Vineyard area). Although limited groundwater pumping occurs north of Elder Creek Road, groundwater contamination and the potential for movement of contaminant plumes in the Aerojet and Mather areas severely limits the opportunity to develop additional groundwater pumping facilities.

Historical methods of chemical disposal and past remediation efforts at the Aerojet and McDonnell-Douglas (now Boeing) (responsible parties) facilities have resulted in extensive contamination of local groundwater supplies. Of particular concern are the chemicals ammonium perchlorate and N-nitrosodimethylamine (NDMA); though currently unregulated, an “action level” for each has been defined by the appropriate regulatory agencies, essentially prohibiting the use of groundwater from the contaminated zone for drinking water.

This situation will have a number of significant effects on Zone 40 groundwater supply:

1. Wells can not be constructed in developing areas located above or near the contaminant plume. While the sustainable yield of the basin will remain the same, groundwater production will be somewhat more concentrated in the central and southern portions of the zone than initially assumed.
2. Regulating agencies have directed the responsible parties to pump and treat the contaminated groundwater. It is expected that as much as 36,000 AF/year may be extracted for treatment over decades.
3. An agreement between the responsible parties and SCWA transfers ownership of the 36,000 AF/year of remediated groundwater to SCWA. Reuse requirements including point(s) of discharge, point(s) of diversion, and capital facility requirements still need to be defined as part of the East Sacramento County Replacement Water Supply Project before this water can be used to the benefit of the basin.

Other smaller contaminant plumes exist in areas proximate to both active and inactive landfills located within or adjacent to Zone 40 as shown in **Figure 3-2**. These include Kiefer Landfill, Gerber Landfill, Elk Grove Landfill, and the Dixon Pit Landfill. Active mitigation programs at both the Kiefer and Elk Grove Landfills have controlled off-site migration of these plumes. According to the Regional Water Quality Control Board (RWQCB), the plume associated with the Gerber and Dixon Pit Landfills are shallow in nature and do not pose a threat to existing or future wells in the area. All other plumes are continuously being monitored and SCWA is working closely with the RWQCB on siting of new wells and assessing impacts on existing wells.

Water Quality



The quality of existing and potential water supply sources will determine the selection of appropriate treatment processes. The following discussion provides a review of current and anticipated drinking water regulations and of the resulting treatment needs. The discussion concludes with recommended treatment process for both surface water and groundwater.

WATER QUALITY

4.1 DRINKING WATER REGULATIONS

The following is a summary of current drinking water regulations promulgated by the United States Environmental Protection Agency (EPA) and enforced by the California Department of Health Services (DHS). Also included is a brief description of drinking water regulations that are anticipated to be promulgated over the next several years. This information is provided to evaluate the impact existing and future regulations have on water supply for the 2030 study area.

4.1.1 Background

The Safe Drinking Water Act (SDWA) was enacted by Congress in 1974. Through the SDWA, EPA has authority to set maximum allowable levels of contaminants in drinking water supplies. Historically, the first step EPA takes in establishing regulations for contaminants is to establish a maximum contaminant level goal (MCLG). An MCLG is the estimated level at which no adverse human health risks are expected. EPA then attempts to establish either a maximum contaminant level (MCL) or a treatment technique that will reduce the presence of the contaminant in drinking water to a level that is as close to the MCLG as is technically and economically feasible. Once an MCL has been established, EPA is then required to designate a Best Available Technology (BAT) to meet the new MCL.

4.1.2 Existing Regulations

With respect to SDWA regulations, California is a primacy state, which means the state is responsible for implementing these regulations within California. DHS has been designated by the state to enforce SDWA regulations. Under primacy rules, DHS must enforce regulations that are at least as stringent as those promulgated by EPA, and may also promulgate and enforce additional regulations not mandated by the EPA.



The categories of regulated contaminants (primary MCLs) include microorganisms, disinfectants, disinfection byproducts, inorganic chemicals, organic chemicals, and radionuclides. Primary MCLs protect public health by limiting the levels of contaminants in drinking water.

DHS has also established secondary MCLs for a number of contaminants. Secondary MCLs were established to protect the aesthetic quality of drinking water and are generally unrelated to human health. Secondary MCLs are enforceable standards in California, although not under Federal regulations.

Title 22 of the California Code of Regulations (CCR) lists all regulated contaminants for drinking water in the state.

4.1.3 Anticipated Regulations

EPA is currently formulating several new regulations needed to maintain compliance with the SDWA and the SDWA Amendments. These are briefly described below.

Long-Term 2 Enhanced Surface Water Treatment Rule

The purposes of Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) are to improve control of microbial pathogens, including specifically the protozoan *Cryptosporidium*, in drinking water and to address risk trade-offs with disinfection byproducts. This could have a significant impact on existing surface WTPs and the design of future plants.

Radon

At present, EPA has proposed standards for radon that include a multimedia framework for implementation of the rule. This includes two options:

- States can choose to develop enhanced state programs to address the health risks from radon in indoor air—known as Multimedia Mitigation (MMM) programs—while individual water systems reduce radon levels in drinking water to 4,000 pico curies per liter (pCi/L) or lower.
- If a state chooses not to develop an MMM program, individual water systems in that state would be required to either reduce radon in their system's drinking water to 300 pCi/L or develop individual local MMM programs and reduce levels in drinking water to 4,000 pCi/L.

The California radon program is awaiting action by EPA on the proposed radon rule. Should EPA finalize the radon rule for drinking water, California's radon program will be making decisions on program development driven by the rule. The

measured radon levels in municipal wells in the 2030 study area range from 100 pCi/L to 670 pCi/L.

Potential Contaminants for Future Regulation

EPA is required, under the SDWA, to establish standards for 25 additional contaminants every three years. It is expected that the majority of contaminants to be added to the regulations will come from the 1991 Drinking Water Priority List.

4.1.4 Fluoride

The addition of fluoride to municipal drinking water systems has been vigorously promoted by the dental community in order to provide tooth-decay fighting properties in drinking water. The practice of drinking water fluoridation has the support of the California Dental Association, the U.S. Centers for Disease Control and other important public health groups. San Francisco began fluoridating its drinking water supply in 1951, Oakland in 1976, and the City of Sacramento in 2000.

The provision of water fluoridation in a municipal water system is typically in response to an initiative passed by a vote of the people and is not a regulatory requirement. The City of Sacramento passed an initiative in 2000 and is currently providing its customers with fluoridated water. SCWA through its connection with the City at the Franklin Boulevard inter-tie receives fluoridated water that is blended with unfluoridated water from the Zone 40 water system.

4.2 ZONE 40 GROUNDWATER QUALITY

Source groundwater quality in Zone 40 meets all primary and secondary CCR Title 22 drinking water quality standards, with the exception of iron, manganese, and arsenic. A number of wells in the 2030 study area exceed secondary drinking water standards for iron and manganese. Secondary standards were established by EPA for aesthetic concerns (e.g., staining of laundry and porcelain fixtures), and at elevated levels do not pose a health hazard. DHS has made it a requirement to treat for iron and manganese.

Arsenic concentrations in six shallow older wells have been measured at levels that exceed recently implemented federal drinking water standards of 10 parts per billion (ppb) (January 2001); these regulations require compliance by January 2006. Radon has also been measured in the groundwater in the 2030 study area, although not at levels exceeding current drinking water standards. However, as discussed in **Section 4.1–Drinking Water Regulations**, EPA is considering new standards for radon that could result in the need for treatment.

4.3 GROUNDWATER TREATMENT

The following identifies the treatment process(es) required for the removal of iron, manganese, and potentially arsenic and radon from groundwater. SCWA currently operates eight iron and manganese treatment facilities in Zone 40 (Mather Housing, Calvine Meadows, Waterman, East Park, Dwight, East Elk Grove, Lakeside, and Poppy Ridge). Seven more facilities are in various stages of planning (Franklin, Big Horn, Laguna Ridge, Sheldon, Wildhawk, North Vineyard Station, and Sunrise Douglas). These groundwater treatment plants are shown in **Figure 5-2**.

4.3.1 Iron and Manganese Treatment

Iron and manganese in groundwater are typically removed as precipitates through sedimentation and/or filtration processes. SCWA uses oxidation and filtration with a manganese zeolite (greensand) filter media.

4.3.2 Arsenic Removal

EPA published the final rule for arsenic in January 2001 and identified the following BATs for achieving compliance with the new regulation:

- Ion Exchange
- Activated Alumina
- Oxidation/Filtration
- Reverse Osmosis
- Electrodialysis Reversal
- Enhanced Coagulation/Filtration
- Enhanced Lime Softening

All newer treatment facilities provide for the future treatment for arsenic should it become necessary. The six older wells mentioned earlier will not meet the new standards and may have to be abandoned because of site restrictions that prevent the installation of treatment facilities.

4.3.3 Radon Removal

Treatment processes for removing radon from water include air stripping and activated carbon adsorption. Air stripping transfers radon from water to the atmosphere. At a stand-alone well, water is depressurized, run through the air stripper,

and then re-pumped to the distribution system. At a treatment facility the water can pass through an air stripping unit or through the facility's storage tank, provided the intake manifold is modified to increase water contact with air.

An alternative technology for removing radon is adsorption on granular activated carbon (GAC). This process involves passing water through a pressure vessel containing GAC media. The radon then adsorbs to the surfaces of the GAC, which must be replaced periodically after its adsorptive capacity diminishes. It is likely that GAC would have to be disposed of at a Class 1 landfill as a contaminant waste. A backwash system may be required to periodically clean the bed of particulate matter.

4.3.4 Process Recommendation

Depending on future regulations, most wells will contain concentrations of arsenic, iron, manganese, or a combination of these that will exceed regulatory standards. No single treatment process addresses all of these constituents effectively.

For planning and cost estimating purposes, it is recommended that a combination of treatment processes be used that will address all of the constituents of concern. The recommended process consists of oxidant and/or chemical addition, filtration, and disinfection.

To take advantage of economies of scale and to minimize operations and maintenance (O&M) costs, treatment plants will be designed to serve a group of wells equipped with low-head pumps and connected to a single dedicated raw water delivery pipeline. After treatment, water will be pumped into the distribution system.

If radon treatment is required, aeration at a facility's storage tank would be added to the recommended process train (in the event that the State does not implement a MMM program for radon) in order to avoid the need to de-pressurize the water and re-pump after treatment.

Arsenic removal will be achieved through the same process, which removes iron and manganese (oxidant and/or chemical addition, filtration, and disinfection). The amount and type of chemicals necessary to provide for arsenic treatment will be determined through either bench- or pilot-scale testing.

4.4 SURFACE WATER QUALITY

The purpose of this section is to provide an overview of the water quality of the Sacramento River at the proposed points of diversion. The yield, availability, and reliability of various surface water supply components are discussed in more detail in **Section 5–Water Supply Sources and Facilities**.

Water quality parameters of interest in evaluating surface water for use as a drinking water source are divided into three categories: physical, chemical, and bacteriological. Physical parameters include temperature, color, turbidity, and odor. Chemical parameters include both inorganic constituents such as pH, TDS, and trace metals, and organic constituents such as total organic carbon and pesticides. Bacteriological parameters of interest include coliform, viruses, Giardia, and Cryptosporidium.

SCWA surface water contracts provide for two points of diversion, at or near the mouth of the American River or just north of the community of Freeport on the Sacramento River.

Water quality parameters in the Sacramento River were evaluated based on data collected in the Sacramento River Watershed Sanitary Survey – Cities of Sacramento and West Sacramento, (Montgomery Watson/Archibald & Wallberg, 2000) and Technical Memorandum 3 – Sacramento River Sanitary Survey 2000 Update, (Montgomery Watson/Archibald & Wallberg, 2001). The sanitary survey update indicates that the Lower Sacramento River, upstream of Freeport, is a good source of drinking water. The water can easily be treated to meet all CCR Title 22 MCLs using conventional filtration processes. According to the update, there appears to be low levels of protozoan contamination, low organic carbon levels, and isolated taste and odor incidents from thiobencarb. These findings are similar to those for the Sacramento and American Rivers upstream of the Sacramento River Water Treatment Plant (SRWTP). A review of each constituent evaluated is provided in **Appendix F**.

4.5 SURFACE WATER TREATMENT

Treated surface water alternatives for Zone 40 include purchase of existing City water treatment facility capacity or constructing a new water treatment facility. An important consideration in the evaluation of a surface water source is the treatment processes ultimately required to produce safe, wholesome, potable water.

4.5.1 Treatment Process Determination

The use of the City's SRWTP would require SCWA to purchase dedicated capacity in the treatment plant. Water quality at the SRWTP's point of diversion has been evaluated by DHS and a water supply permit issued indicating the appropriate level of treatment. Under its water supply permit, the City diverts and processes surface water that meets all drinking water standards established by DHS and EPA.

For surface water diverted at Freeport, SCWA, in conjunction with DHS, will ultimately make a determination as to the appropriate level of treatment (log removal requirements). Based on an evaluation of available surface water quality data and treatment process capabilities (see **Appendix F**), it is recommended that conventional treatment (i.e., flocculation, sedimentation, and filtration) be utilized to treat surface water diverted at this site.

SECTION 5

Water Supply Sources & Facilities



This section describes sources of water supply and the capital facilities required for treatment, storage, and conveyance. The sources and quantities of water supply identified within this section are consistent with SCWA, SMUD, and the City's PSA's as described in the WFA.

WATER SUPPLY SOURCES AND FACILITIES

5.1 WATER SUPPLY SOURCES

The following identifies and characterizes the water supply sources that will be used to meet projected demands within the 2030 study area. Key to the availability of these sources is the WF PSAs (see **Section 1.2.3–Water Forum Agreement** and **Appendix A**). Based on projected 2030 unit water demand factors and land use (**Table 2-2** and **Figure 2-4**), SCWA's water demand is projected to be approximately 113,064 AF.

The water supply sources or components identified in this Plan are grouped into three categories: (1) groundwater, (2) surface water, and (3) recycled water. Groundwater refers to groundwater pumped from the Central Basin (**Figure 3-1**). Surface water refers to water entitlements from the American and/or Sacramento Rivers. Recycled water refers to tertiary treated wastewater from the SRCSD that can be used for non-potable indoor and outdoor purposes (e.g., right-of-way, commercial, industrial, parks, and schools).

In the following tables (**Tables 5-1, 5-2, and 5-3**), maximum use/entitlement amount refers to the maximum quantity of water available from that source in any one year; estimated long-term average use refers to the average use of a source of supply based on an evaluation of 72 years of hydrologic data for Sacramento County; and reliability refers to the availability of water from a particular source. Some sources of water are subject to restrictions or cut-backs in dry and critically dry years, which would affect their level of reliability.



5.1.1 Groundwater Component

Groundwater for this component comes from the Central Basin and includes remediated groundwater in accordance with SCWA's agreements with Aerojet and Boeing¹³. The component is described in **Table 5-1** and briefly below, and is discussed in greater detail in **Section 3–Groundwater Availability**.

5.1.1.1 Groundwater

Groundwater pumping capacity is developed to (1) provide sufficient capacity to meet projected maximum day demands and (2) to meet conjunctive use objectives as outlined in the WFA.

As a condition of the second assignment of SMUD CVP surface water entitlements (see discussion of the SMUD 2 Assignment in **Section 2.6–Demand Modeling** and in the **Surface Water Components** section below), SCWA is obligated to provide groundwater to SMUD in dry and critically dry years as defined in SMUD's PSA (see **Section 3.3–Groundwater Demands**). The demand frequency and amounts of groundwater are presented in **Figure 5-1**.

Groundwater is considered to be the last priority in meeting water demands after surface water entitlements and surface WTP capacity are used. Variability in groundwater use is a result of the conjunctive use program, dry year deliveries to SMUD, and the variability in the availability of surface water supplies. **Figure 5-1** illustrates the amount of groundwater that is needed to meet demand over the long-term. The maximum, minimum, and average annual use of groundwater water is 69,900 AF, 27,300 AF, and 40,900 AF, respectively. **Figure 5-2** identifies the location of existing and proposed groundwater treatment plants.

5.1.2 Surface Water Components

Surface water supplies for this component will come from the American and Sacramento Rivers. All surface water supplies will require conventional treatment prior to distribution within Zone 40 (see **Section 4.5–Surface Water Treatment**). Each of the six surface water components is described briefly below. Key aspects of each component are detailed in **Table 5-2**.

5.1.2.1 Appropriative Water

SCWA has submitted an application to the State Water Resources Control Board (SWRCB) for the appropriation of water from the American and Sacramento Rivers (the Board authorized submittal of this application on May 30, 1995). This water is considered “intermittent water” that typically would be available during the winter months of normal or wet years. This water could be used for groundwater recharge. **Figure 5-3** presents the frequency of use for appropriative water based on the most recent CALSIM II modeling. The maximum, minimum, and average annual use of appropriative water is 71,000 AF, 0 AF, and 21,700 AF, respectively¹⁴. The somewhat even distribution of water indicates the variability of supplies over wet and dry year periods. In close to 30 percent of the years, 12,000 AF or less of appropriative water is used.

5.1.2.2 CVP Supplies

SMUD 1 Assignment

Under the terms of a three party agreement (SCWA, SMUD, and the City), and in accordance with SMUD's PSA, the City provides surface water to SMUD for use at two of SMUD's cogeneration facilities (because the cogeneration facilities are located within the City's American River POU, authorization by SWRCB is not required). SMUD, in turn, will assign 15,000 AF/year of its Reclamation CVP contract water to SCWA for M&I use. This CVP contract assignment is complete.

SMUD 2 Surface Water Assignment

SMUD's PSA directs SMUD to assign a second 15,000 AF/year to SCWA and for SCWA to construct groundwater facilities necessary to meet SMUD's dry year water shortages of up to 10,000 AF/year. This CVP contract assignment is complete (see **Section 3.3.2–SMUD's Purveyor Specific Agreement**).

CVP Water Public Law 101-514 (“Fazio” Water)

In April 1999, SCWA obtained a CVP water service contract pursuant to PL 101-514 that provides a permanent water supply to Zone 40 of 15,000 AF/year.

¹³ The SCWA agreements with Aerojet and Boeing make up the supply of water for the East Sacramento County Replacement Water Supply Project. The net increase, if any, in extractions above that stated in the WFA has not been determined. It is assumed that all or most of this water will replace wells impacted by groundwater contamination in the Central Basin.

¹⁴ Any difference with Table 5-1 for the long-term average use is due to the updated model runs.

Table 5-1. Detail of Groundwater Supply Component

Component	Water Source	Maximum Use (AF/year)	Estimated Long-Term Average Use (AF/year)	Reliability
Groundwater	Groundwater Extracted from the Central Sacramento County Groundwater Basin	69,900 ¹	40,900 ¹	High

Notes: 1. Maximum and average groundwater use is based on the timing and amount of surface water available from each source based on estimates of their reliable yield, as determined by CALSIM II modeling.

Figure 5-1. Frequency Distribution of Groundwater Use

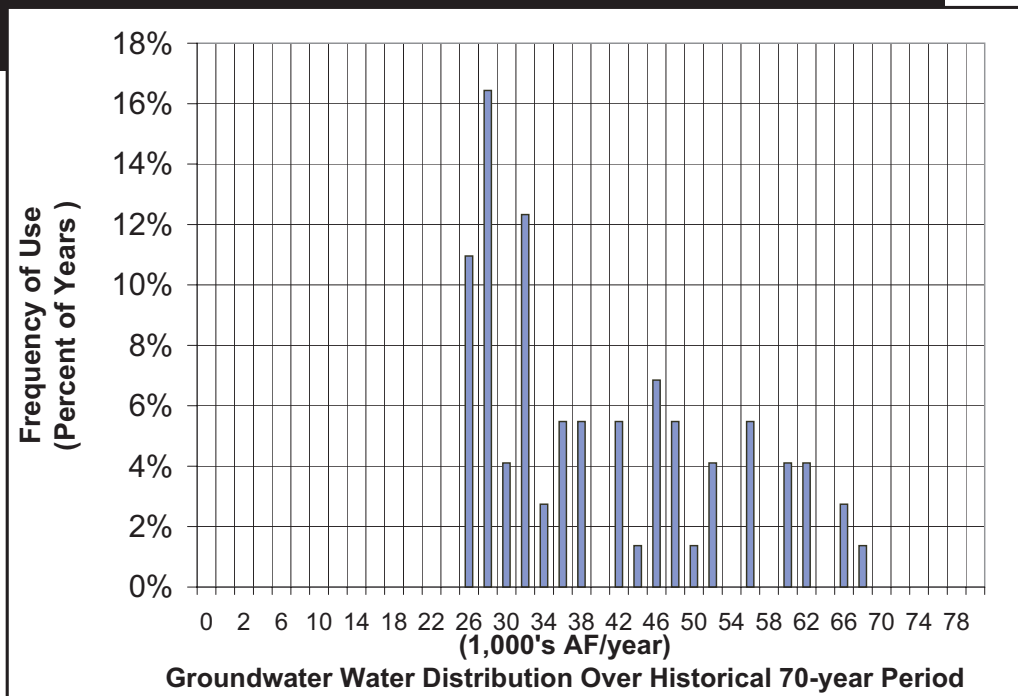


Figure 5-4 presents the frequency of use of CVP water based on CALSIM II modeling. The maximum, minimum, and average annual use of CVP water is 45,000 AF, 8,700 AF, and 38,000 AF, respectively ¹⁴. The high peak at 45,000 AF reflects the firm supply of CVP water in most years. Lesser amounts result from CVP deficiencies in dry years.

5.1.2.3 Other Water Supplies

Other water supplies are considered to be firm water supplies either from the City American River POU or water transfers from other upstream water districts on the Sacramento and/or American Rivers.

Wholesale Water Agreement(s) with City to Serve Portion of Zone 40 in City’s American River POU

SCWA’s PSA directs SCWA to enter into an agreement with the City whereby the City will sell surface water to SCWA for

use in the portion of the 2030 study area that lies within the City’s American River POU (see **Figure 1-1**). The amount of water within the POU is assumed to be 9,300 AF.

Transfer Water Supplies

To obtain transfer water supplies, SCWA would enter into purchase and transfer agreements with other entities that currently hold surface water rights upstream of SCWA’s points of diversion. This water could also be used for groundwater recharge.

Figure 5-5 presents the frequency of use of Other Water Supplies based on CALSIM II modeling. The maximum, minimum, and average annual use of Other Water Supplies water is 9,600 AF, 0 AF, and 6,200 AF, respectively. The American River POU water is included within this distribution.

Figure 5-3. Frequency Distribution of Appropriative Water Use

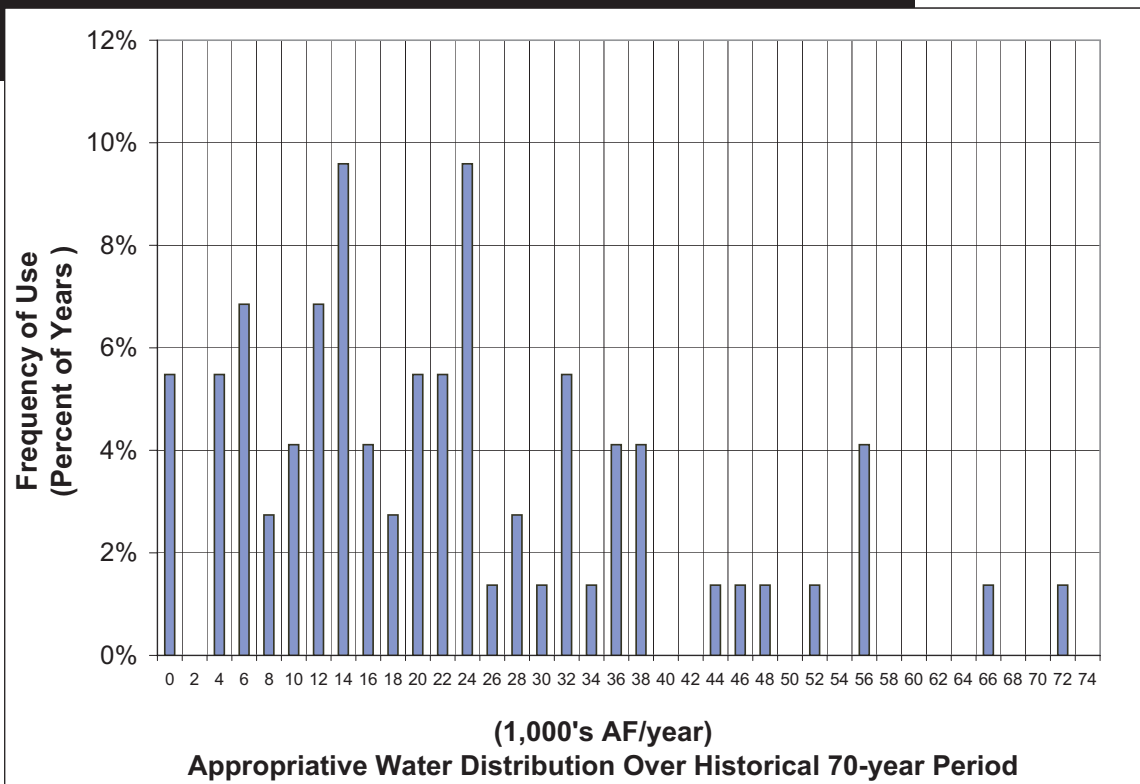
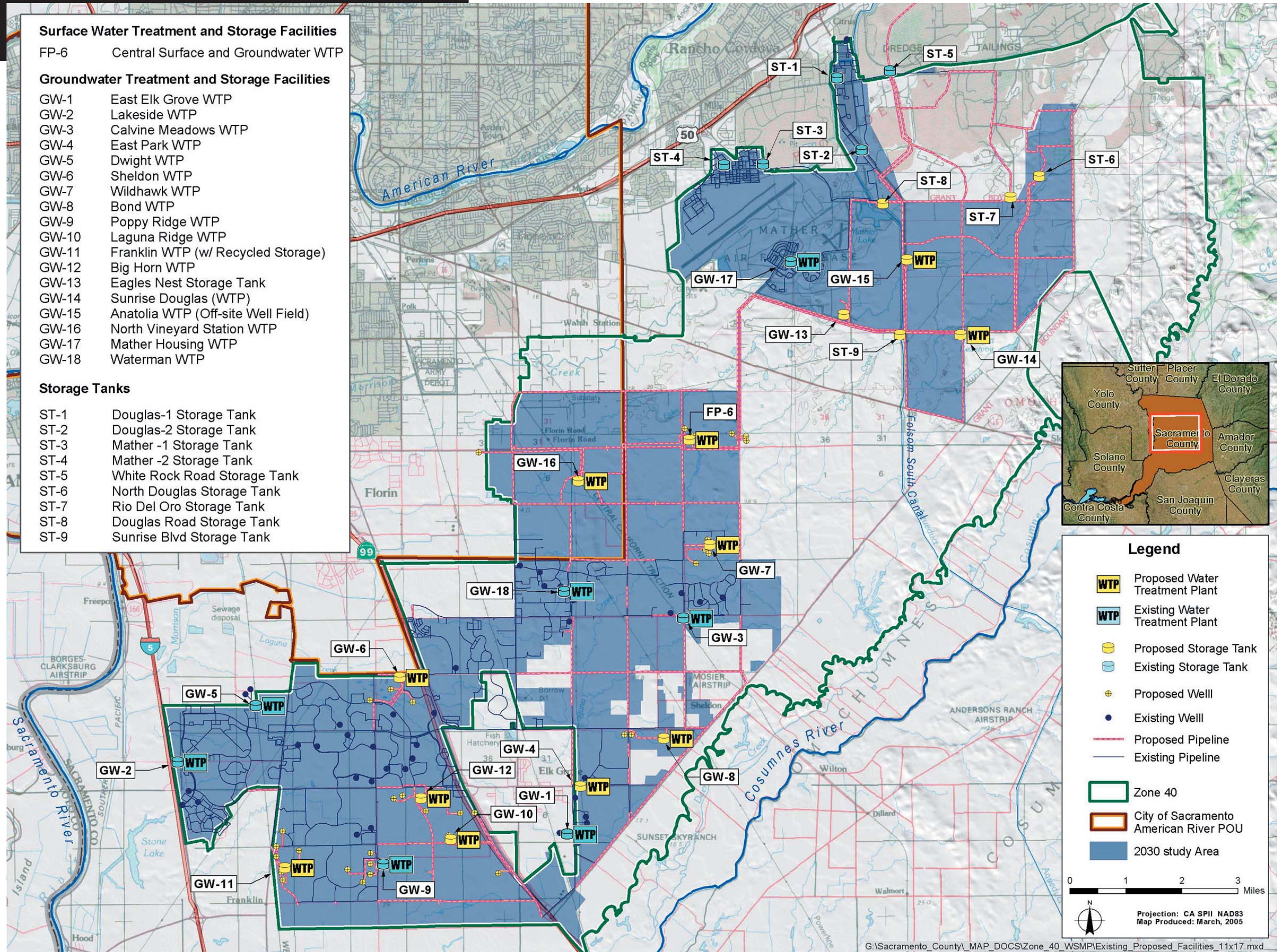


Figure 5-2. Existing and Proposed Water Treatment Plants, Storage Facilities, and Distribution System



5.1.3 Recycled Water Component

The recycled water component is a supply of tertiary treated “recycled” wastewater for non-potable use. These uses are primarily landscape irrigation at parks, schools, and rights-of-way. The recycled component is described briefly below. Key aspects are detailed in **Table 5-3**.

Recycled Water for Urban Landscaping from the Sacramento Regional Wastewater Treatment Plant

Recycled water is purchased by SCWA from the SRCSD for non-potable uses. Expected maximum day use is approximately 9 mgd.

Figure 5-4. Frequency Distribution of CVP Water Supply Use

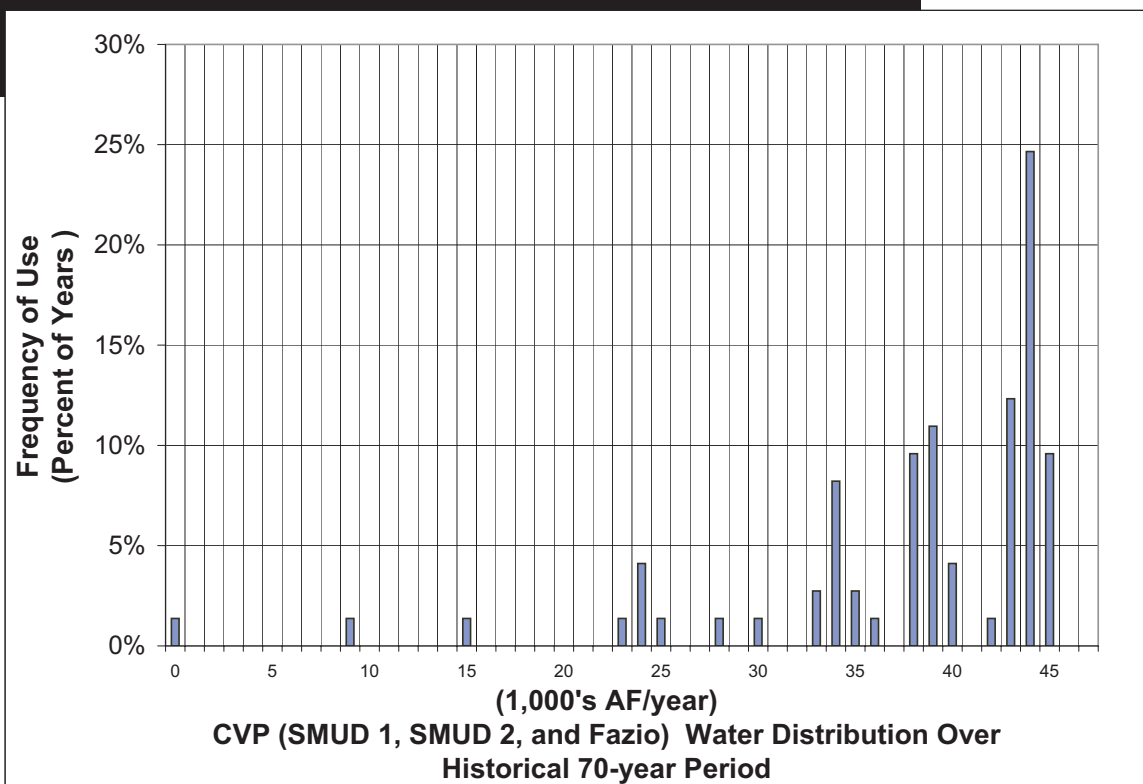


Table 5-2. Detail of Surface Water Supply Components

<i>Component</i>		<i>Water Source(s)</i>	<i>Entitlement Amount (AF/year)</i>	<i>Estimated Long-Term Average Use (AF/year)</i>	<i>Reliability</i>
Appropriative Water Supplies		American and Sacramento River	Undetermined	14,586	Low
CVP Supplies	SMUD 1 Assignment	American River	15,000	13,000	Moderate
	SMUD 2 Assignment	American River	15,000	13,000	Moderate
	"Fazio" Water (PL 101-514)	American River	15,000	13,551	Moderate
Other Water	Other Transfer Water Supplies	American and Sacramento River	Undetermined	5,200	Variable (Moderate to High)
	Wholesale Water Agreement(s) within City to serve portion of Zone 40 in City's American River POU	American River	9,300	9,300	High
<i>Total Surface Water</i>				<i>68,637</i>	

5.2 WATER SUPPLY CAPITAL FACILITIES

The following describes the capital facility components required for the treatment, storage, and conveyance of the water supply components identified above. As of late 2004, Zone 40 facilities include a transmission and distribution system, approximately 46 mgd of groundwater production facilities, and 6 mgd (expandable to 11 mgd) of non-dedicated surface water capacity from the City's SRWTP. The total expected water facility capacity for groundwater and surface water is based on a total 2030 maximum day need of approximately 211 mgd. Additional groundwater, surface water, and recycled water facilities are considered vital components of this WSMP. Three alternatives are considered for new or expanded surface water treatment facilities and related conveyance facilities. Cost estimates have been developed for each of the facility components described below.

Water supply capital facility components have been grouped into the same three general categories as the water supply components: (1) groundwater, (2) surface water, and (3) recycled water. All facilities necessary to develop a particular supply component (i.e., wells and conveyance systems) have been grouped together under these categories.

5.2.1 Groundwater Facility Component

The facility component for groundwater is detailed in **Table 5-4**. The facility component is also discussed in **Appendix G**.

Groundwater

Capital facilities necessary to provide groundwater production capacity include wells (includes raw water piping to the treatment plant), treatment, storage (storage and pumping), and conveyance to the distribution system. It is assumed that most treatment facilities will have a maximum day input capacity

Figure 5-5. Frequency Distribution of Other Water Supply Use

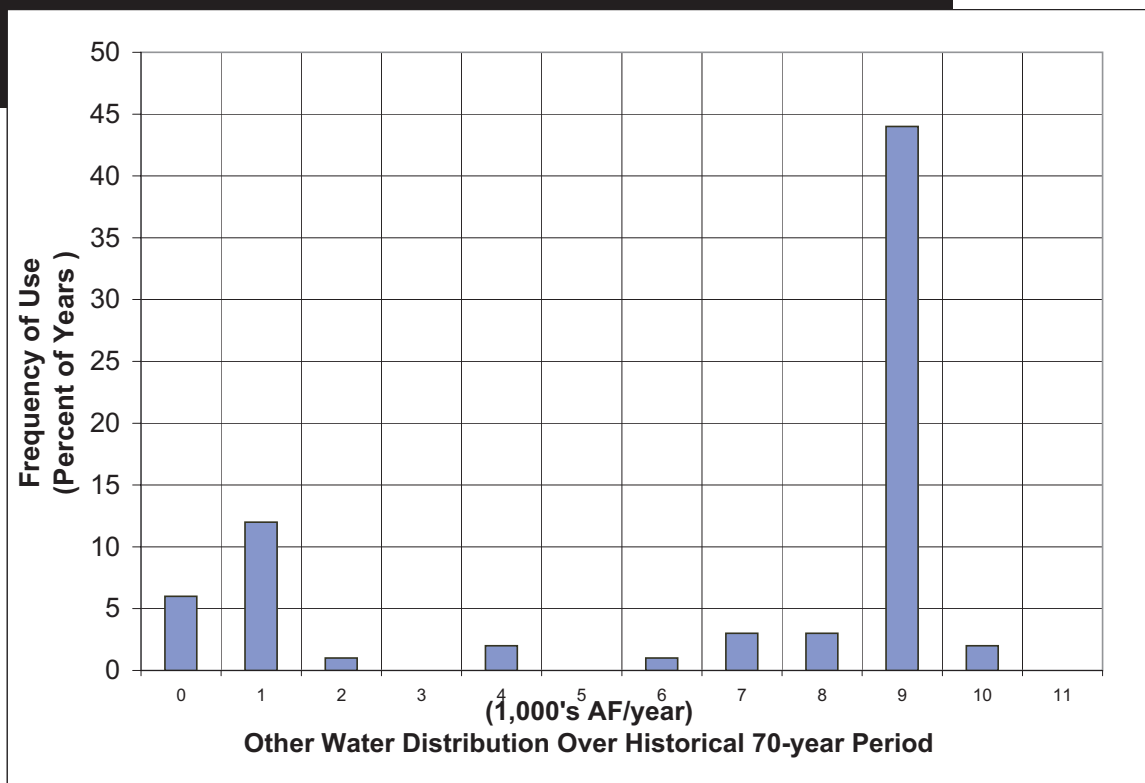


Table 5-3 Detail of Recycled Water Supply Component

<i>Component</i>	<i>Water Source</i>	<i>Maximum Use (AF/year)</i>	<i>Average Use (AF/year)</i>	<i>Reliability</i>
Recycled Water	Sacramento Regional Wastewater Treatment Plant Tertiary Facility	4,400	4,400	High

Table 5-4. Detail of Groundwater Facility Component

<i>Facility Component</i>	<i>Required Facilities</i>	<i>Capital Costs (Millions of Dollars)</i>
Single Groundwater Water Treatment and System Storage Capacity	<ul style="list-style-type: none"> • Wells • Treatment • Storage (Storage & Pumping) • Emergency Power • Conveyance 	10 mgd – (with iron & manganese treatment) \$16.0 - \$18.0

2002 dollars ENR/CCI 7069

Table 5-5. Detail of Alternative Surface Water Facility Components

<i>Facility Component Alternative</i>	<i>Required Facilities</i>	<i>Capital Costs (Millions of Dollars)</i>
SCWA Freeport WTP	Conventional Treatment Plant w/ Intake Structure and Conveyance Piping	\$257
Freeport Regional Water Project	Conventional Treatment Plant w/ Intake Structure and Conveyance Piping	\$280
SCWA/City of Sacramento Joint Project	Conventional Treatment Plant w/ Intake Structure and Conveyance Piping	\$274

2002 dollars ENR/CCI 7069

of approximately 10 mgd per facility (i.e., six wells with a 1,500 gpm capacity operating 75 percent of the day). Treatment plants will be developed for iron, manganese, and possible arsenic removal. While dependent on the conjunctive use scenario, it can be expected that up to seven new groundwater treatment and storage facilities may be required to meet Zone 40's conjunctive use objectives.

Groundwater recharge ("direct recharge") may be considered in the future as a way to enhance SCWA's conjunctive use program within the Central Basin. Direct recharge could consist of injection wells, spreading basins within the Cosumnes River floodplain, or direct discharge into the Cosumnes River to recharge the aquifers underlying the Central Basin. Water could potentially be obtained from either "Appropriative" or "Other" surface water sources, depending on availability. Treatment of surface water and approval by the RWQCB would be required prior to proposing injection of treated water into the aquifer. On-going testing of direct recharge through injection wells is being completed in the City of Roseville area which may set the standards for injection recharge programs in Sacramento County.

5.2.2 Surface Water Facility Component

The facility component for surface water consists of three alternatives: (1) SCWA Freeport WTP, (2) Freeport Regional Water Project, or (3) SCWA/City of Sacramento Joint Project.

The alternative surface water facility components are detailed in **Table 5-5** and discussed below and in **Appendix G**.

SCWA Freeport WTP

This alternative consists of: 1) the construction of a diversion structure on the Sacramento River near the community of Freeport; 2) a raw water conveyance pipeline from the diversion structure to the treatment plant; and 3) an 85 mgd (ultimate capacity) surface water treatment facility to be located on or near the Sacramento County Regional Sanitation District's wastewater treatment plant's "buffer lands." This component includes the existing 6 mgd (expandable to 11 mgd) of non-dedicated capacity at the City's SRWTP (the Wheeling Agreement with the City provides for conversion of non-dedicated capacity to dedicated capacity). This alternative also includes appurtenant treated water conveyance facilities.

Freeport Regional Water Project

This alternative consists of SCWA and East Bay Municipal Utility District (EBMUD) constructing a diversion structure on the Sacramento River near the community of Freeport and a raw water conveyance pipeline from the diversion structure to the central portion of Zone 40 (EBMUD's portion of the pipeline continues on to the Folsom South Canal). SCWA constructs an 85 mgd (ultimate capacity) surface water treatment facility in the central portion of Zone 40, and appurtenant treated water conveyance pipelines. This component includes the existing 6 mgd (expandable to 11 mgd) of non-dedicated capacity at the City's SRWTP (the Wheeling Agreement with the City provides for conversion of non-dedicated capacity to dedicated capacity).

Table 5-6. Detail of Recycled Water Facility Component

<i>Facility Element</i>	<i>Required Facilities</i>	<i>Capital Costs (Millions of Dollars)</i>
Recycled Water	<ul style="list-style-type: none"> • Transmission • Storage • Booster Pumps • Distribution System 	Phase 2 - \$15.0

2002 dollars ENR/CCI 7069

SCWA/City of Sacramento Joint Project

This alternative consists of SCWA purchasing 80 mgd of dedicated treatment plant capacity from the City and constructs treated water conveyance pipelines through the City to deliver water to Zone 40. This component includes the existing 6 mgd (expandable to 11 mgd) of non-dedicated capacity at the City's SRWTP (the Wheeling Agreement with the City provides for conversion of non-dedicated capacity to dedicated capacity).

5.2.3 Recycled Water Facility Component

The recycled water facility component consists of the construction of pipelines, storage, and pumping capacity to deliver recycled water to customers within the study area. The recycled water component requires a distribution system separate from the potable water distribution system. Phase 1 of this component is complete and operational. The recycled water facility component for Phase 2 is summarized in **Table 5-6** and discussed in greater detail in SCWA Zone 40 Recycled Water Supply Master Plan, (HydroScience, 2003) and in *Addendum to the SCWA Zone 40 Recycled Water Supply Master Plan*, (MWH, 2004).

SECTION 6

Evaluation of Water Supply Alternatives



6

*The purpose of this section is to combine the water supply and capital facilities components discussed in **Section 5 – Water Supply Sources and Facilities** into water supply alternatives. These alternatives will then be evaluated and, based on this evaluation, an alternative will be selected for implementation.*

EVALUATION OF WATER SUPPLY ALTERNATIVES

6.1 ALTERNATIVE FORMULATION

The water supply alternatives to be considered consist of a combination of water supply and capital facilities components that together provide a sufficient amount of water to meet the water demands outlined in this WSMP. The project development criteria used are described below.

6.1.1 Project Development Criteria

One of the objectives of the WFA is to “Provide a reliable and safe water supply for the region’s economic health and planned development to the year 2030.” Accordingly, the alternatives described in this plan were developed to meet the water supply objectives and commitments defined in SCWA’s PSA (see **Appendix A**). The purpose of the following criteria is to ensure that the WFA objective’s can be met by providing sufficient water to meet the needs of water users within the 2030 study area, providing for the beneficial use of said water, and ensuring that long-term depletion of the groundwater aquifer underlying the Central Basin does not occur.

6.1.1.1 Criterion 1—Meet Water Demands

This criterion requires that each alternative meet projected water demands in the 2030 study area. As described in the WFA and **Section 2—Water Demands**, projected annual water demands within the study area are approximately 113,064 AF/year (see **Table 2-2**).



The 113,064 AF/year demand represents average annual conditions within the study area. Application of average annual demands to the design of a water system requires modifying these demands to reflect seasonal and daily variations. July and August are typically the hottest months of the year due to increased demands for landscape irrigation. SCWA has conducted studies and tracked average month, maximum day, and peak hour water demands over a period of time to determine appropriate multipliers to increase estimated average annual demands. These water demand scenarios are discussed in more detail below:

Average Annual Demand

Average annual demand is used to evaluate the adequacy of existing water supplies over the range of hydrologic conditions (i.e., wet, dry, and critically dry). These demands are determined by multiplying the unit water demand factors by the number of acres of a particular land use (see **Table 2-1 and 2-2**). Average day demand is the average annual demand divided by 365 days.

Average Monthly Demand

This demand is generally used to evaluate surface water diversions that are subject to a range of conditions that constrain diversion amounts on a monthly basis. In addition, this demand is used in the design of a true surface water-groundwater conjunctive use water system in which more expensive surface water facilities are designed to accommodate the more sustained average monthly demands and groundwater facilities (or other supplemental supplies) are used to meet the shorter duration maximum day demands as described below. These demands are determined by multiplying the average day demand by a monthly multiplier. July is the maximum water demand month, with a multiplier of 1.56.

Maximum Day Demand

This demand typically occurs during the hottest month of the year and represents the hottest days within that month. Water treatment facilities are designed to accommodate these demands by delivering water to storage reservoirs when demands are below maximum day. This water is used, along with directly treated water, to meet maximum day demands. Regional treated water conveyance systems (i.e., large pipelines) may also be designed using this demand scenario. The maximum day demand multiplier is 2.0 (times the average day demand).

Peak Hour Demand

This demand occurs during a maximum day event and represents the maximum hour within that day. This demand

scenario is used for the design of storage and local water and conveyance pipelines. The peak hour multiplier is 2.0 (times the maximum day demand). Fireflow requirements are also compared with peak hours demands to ensure adequate fire flow exists. If fireflows govern as a facility they will be used rather than peak flow demands.

6.1.1.2 Criterion 2—Provide Beneficial Water Use

This criterion requires that the alternative selected uses water beneficially and efficiently. Beneficial Use is a key requirement of California water rights law. As such, a base level of recycled water and demand management/water conservation are included as common components in all alternatives.

Recycled Water

As discussed in **Section 5—Water Supply Sources and Facilities**, 4,400 AF/year of recycled water will be used to meet non-potable demands by 2030. SRCS D currently operates a 5-mgd tertiary treatment facility at the Regional Wastewater Treatment Plant and is wholesaling recycled water to SCWA for use in the Laguna West/Lakeside/Laguna Stonelake portion of the 2030 study area. A 5-mgd expansion (Phase II) to the tertiary treatment facility is contemplated within the next few years.

Demand Management/Water Conservation

SCWA is committed to a comprehensive water demand management/conservation plan based on Reclamation guidelines and the WFA. The plan provides for full implementation of 16 conservation BMPs by 2010. As a result, demand management/water conservation is expected to reduce unit demands by 25.6 percent relative to the 8 percent assumed in the 1990 use patterns (see **Appendix C and D**).

6.1.1.3 Criterion 3 - No Long-Term Depletion of Groundwater

As part of the WF process, various stakeholder groups (agriculture, M&I, self-supplied pumpers, and environmental groups) negotiated sustainable yields for each of the three groundwater sub-basins within Sacramento County. The negotiated long-term average annual pumping yield for the Central Basin was set at 273,000 AF/year. Of the 273,000 AF/year, an estimated long-term average of 40,900 AF/year is available to Zone 40 for M&I uses (see **Section 3.1.2—Sustainable Yield** for details).

6.2 WATER SUPPLY PROJECT ALTERNATIVES

Three water supply project alternatives have been developed based on the above criteria and the water supply sources and facilities identified in **Section 5**. Each alternative is discussed in detail below (it should be noted that water supply sources, groundwater facilities, and recycled water facilities are identical in each alternative). Facility capacities presented are based on capacity requirements necessary to meet maximum day demand. All alternatives include redundant capacity for emergency use.

6.2.1 Alternative 1—SCWA Freeport WTP

SCWA would construct an 85-mgd surface water treatment facility on or near SRCSD’s wastewater treatment plant site’s “buffer lands.” A diversion structure of like capacity would be constructed near the community of Freeport on the Sacramento River. A pipeline would be constructed between the diversion structure and the proposed treatment facility to convey raw water for treatment (Freeport Conveyance Pipeline [FCP]-01).

Treated water pipelines would be constructed to connect the proposed treatment facility to the 2030 study area at two locations: Power Inn Road (FCP-02), and Bruceville Road (FCP-03).

Existing surface water deliveries of up to 6 mgd from the SRWTP (non-dedicated capacity) to the 2030 study area would continue through the “Franklin Intertie” (a pipeline connection between the City of Sacramento and SCWA located on Franklin Boulevard between Cosumnes River Boulevard and Dwight Road) and would be increased to 11 mgd (non-dedicated capacity) through a new pipeline constructed on Franklin Boulevard (Conveyance Pipeline [CP]-01). Delivery of surface water to other points in the 2030 study area would require additional pipeline along Calvin Road (FCP-04) and Elk Grove-Florin Road (FCP-05 and FCP-06). Deliveries to the northern portion of the 2030 study area would require pipelines along Elder Creek Road (CP-02 and CP-03), along Excelsior Road to Eagles Nest Road via Kiefer Road (CP-04b), and to Sunrise Boulevard (CP-04a). See **Figure 6-1** for a schematic layout of these pipelines.

6.2.2 Alternative 2—Freeport Regional Water Project

SCWA and EBMUD jointly construct a 185-mgd diversion structure near the community of Freeport on the Sacramento River and a raw water pipeline (Joint Conveyance Pipeline [JCP]-01) from the diversion structure to the vicinity of Vineyard and Gerber Road. EBMUD would continue their pipeline on to the Folsom South Canal.

SCWA would construct an 85-mgd surface water treatment facility in the vicinity of the intersection of the extension of Vineyard Road and Florin Road. This facility would be supplied with surface water via a turnout and pipeline from the JCP-01 raw water pipeline. {(Central Conveyance Pipeline [CCP]-01)}.

Existing surface water deliveries of up to 6 mgd from the SRWTP (non-dedicated capacity) to the 2030 study area would continue through the “Franklin Intertie” and would be increased to 11 mgd (non-dedicated capacity) through a new pipeline constructed on Franklin Boulevard (CP-01). Additional capacity from the City of Sacramento is proposed within the American River POU via CP-06. Delivery of surface water to other points in the 2030 study area would require additional pipelines along Florin and Bradshaw Road (CCP-02, CCP-03, and CP-6). Deliveries to the northern portion of the 2030 study area would require a pipeline along Florin Road (CP-02a), and multiple pipelines along Excelsior Road to Eagles Nest Road via Kiefer Road (CP-02c, CP-05), and to Sunrise Boulevard (CP-02b and CP-04). See **Figure 6-2** for a schematic layout of these pipelines.

6.2.3 Alternative 3—SCWA/City of Sacramento Joint Project

SCWA would purchase 80 mgd of dedicated capacity at the City’s SRWTP. A treated water pipeline would be constructed from the plant to the 2030 study area at Power Inn Road (Sacramento Conveyance Pipeline [SCP]-01 and SCP-02), at Bruceville Road (SCP-03), at Elder Creek Road (SCP-04), and at Franklin Boulevard (SCP-05).

Existing surface water deliveries of up to 6 mgd from the SRWTP (non-dedicated capacity) to the 2030 study area would continue through the “Franklin Intertie” and would be increased to 11 mgd (non-dedicated capacity) through a new pipeline constructed on Franklin Boulevard (CP-01). Deliveries to the northern portion of the 2030 study area would require pipelines along Elder Creek Road (CP-02 and CP-03), along Excelsior Road to Eagles Nest Road via Kiefer Road (CP-04), and to Sunrise Boulevard (CP-05). See **Figure 6-3** for a schematic layout of these pipelines.

Figure 6-1. Alternative 1—SCWA Freeport WTP

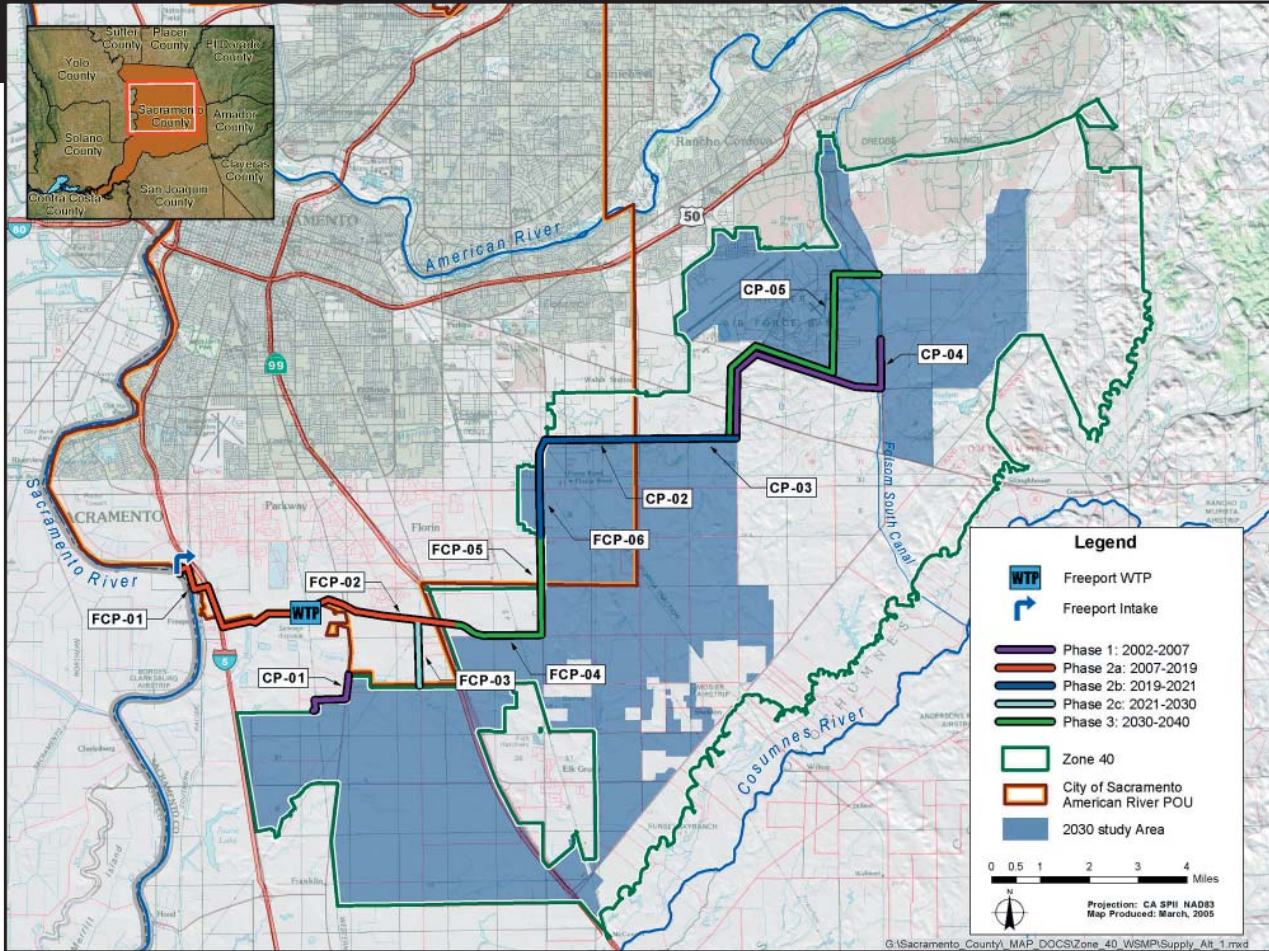


Figure 6-2. Alternative 2—Freeport Regional Water Project

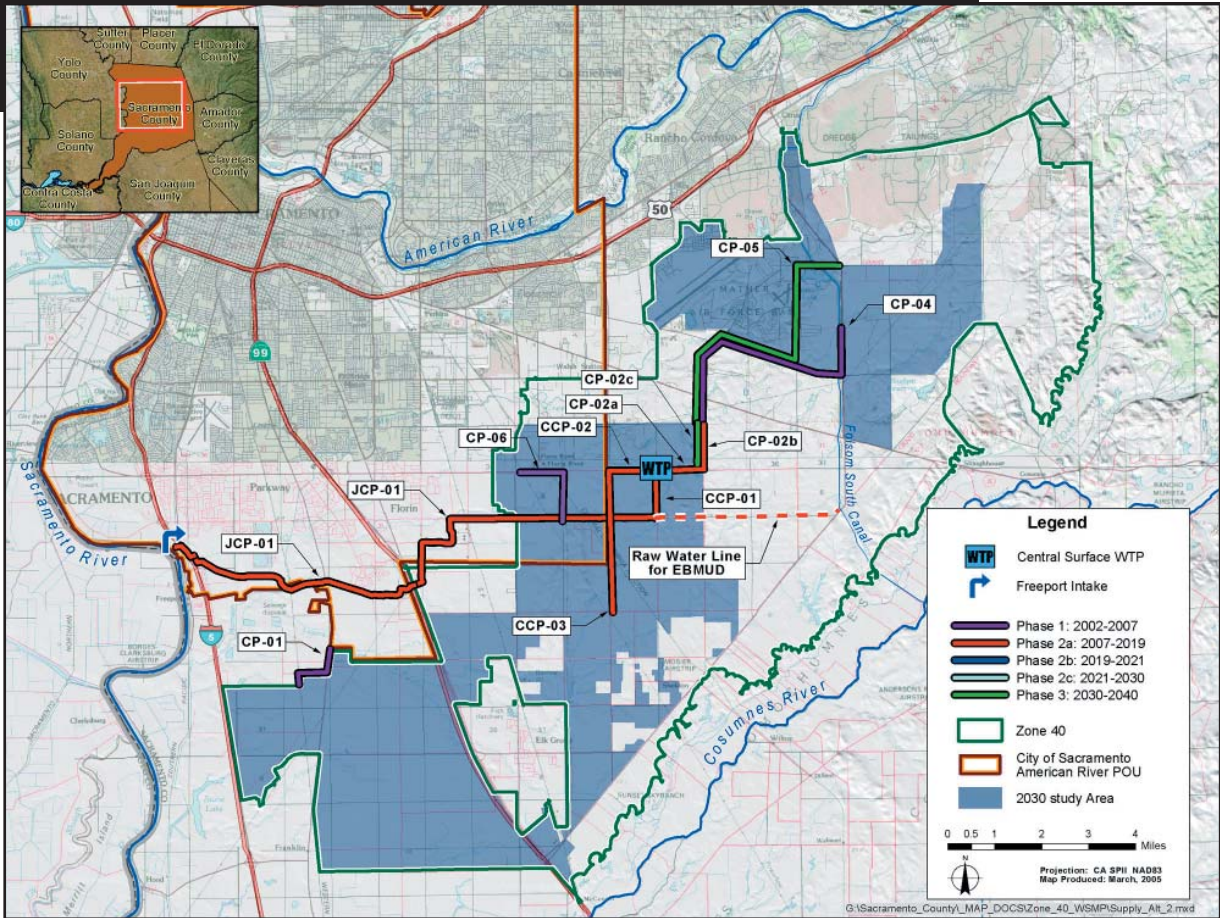
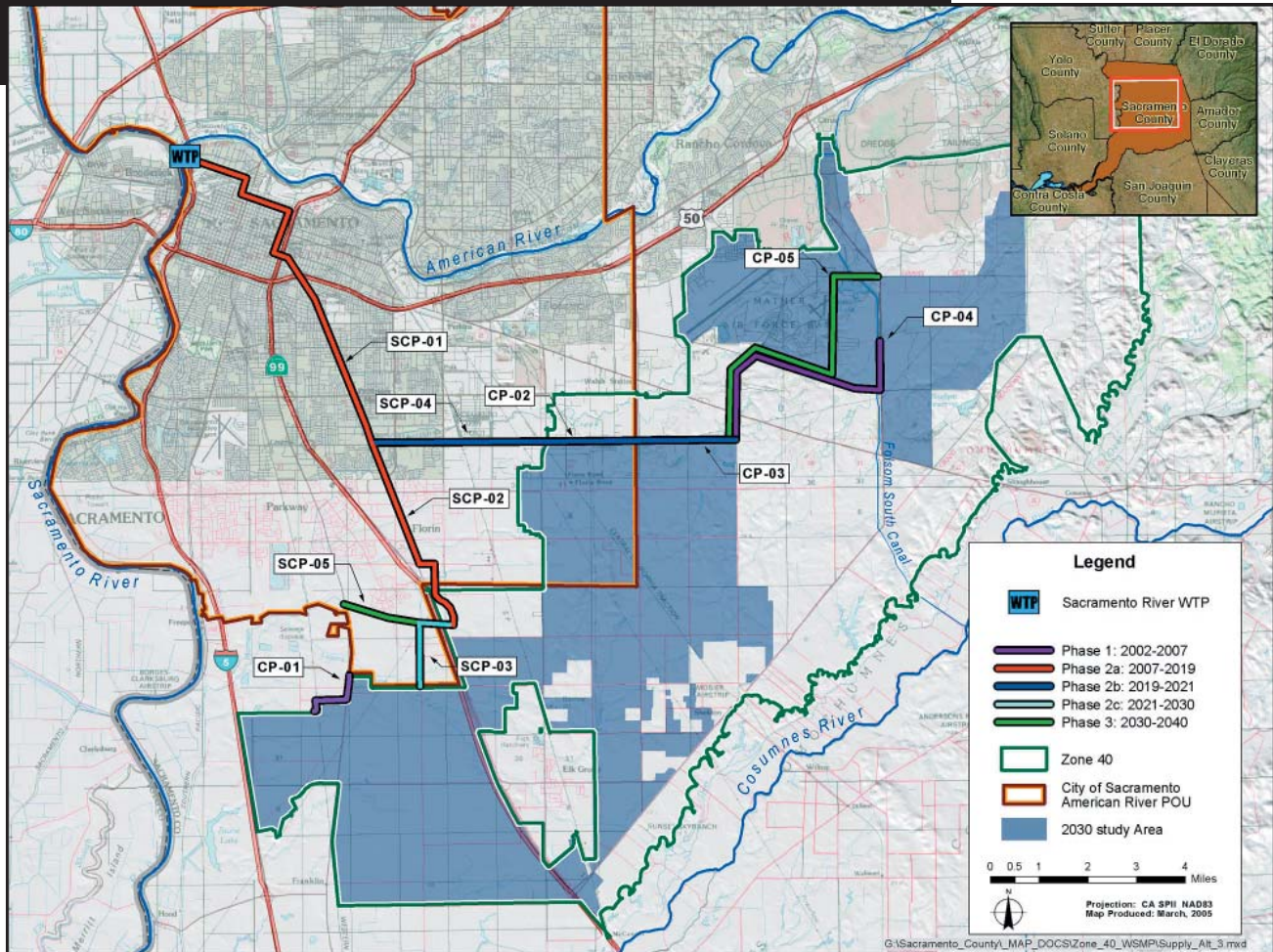


Figure 6-3. Alternative 3—SCWA/City of Sacramento Joint Project



6.3 PROJECT ALTERNATIVE EVALUATION

An evaluation of each of the three project alternatives is described below. Each alternative satisfies the following development criteria: (1) provides sufficient water to meet ultimate build-out demands; (2) utilizes a base level of recycled water and demand management/water conservation; and (3) maintains the long-term average groundwater pumping at 40,900 AF/year. In order to determine a preferred alternative, each alternative is further evaluated based on the following set of evaluation factors.

6.3.1 Evaluation Factors

The evaluation factors have been grouped into the following categories:

- Reliability
- Flexibility
- Implementability
- Environmental Feasibility
- Cost

The following provides an overview of these categories and how they apply in the evaluation of the project alternatives.

Reliability

The ability of a water source to supply a known quantity of water under various types of conditions and constraints is desirable. Source reliability can be affected by hydraulic variability, supply contract terms, and the presence of competing water users. Additionally, reliability can also be affected by the potential for service interruption caused by natural events, such as floods, or by human-caused accidents or sabotage. Also, variations in source water quality may limit the use of water to certain beneficial uses or require additional treatment.

The potential for source interruption is dependent on the type of facility that is constructed (storage, pumps, treatment plants, and delivery pipelines) and the location and length of these facilities in relation to likely natural catastrophic events; man-made hazards, interruptions of service due to mechanical or electrical failure, and operational error. Although these events are unpredictable, the susceptibility to such events can be assessed.

Flexibility

Because of the complexity involved in the development of any long-term water management program, the configuration of alternatives should be adjustable. The ability to adjust the size

and timing of components within an alternative in response to changes in water requirements, economic conditions, governmental regulations, and the activities of other water supply agencies, is desirable.

Components with short implementation times (three to five years) are advantageous to an alternative because long lead time planning is not necessary once a change in the originally assumed conditions is recognized, and an altered alternative configuration is established.

The ability to implement an alternative in phases greatly enhances flexibility and is more amenable to optimization based on economic and financial considerations. Some components, such as those involving wells and water treatment, can easily be constructed in phases, whereas staging of tanks and major pipelines are more difficult.

Implementability

The ease with which the components of an alternative can be brought on line at the time required is a function of (1) the extent of participation of other agencies, (2) the technical certainty associated with its components, (3) the number of permits required, (4) the environmental impacts, and (5) public perception. The following features enhance the implementability of an alternative:

- The alternative requires no outside agency participation.
- The alternative components are well-defined technologically.
- Component configurations are largely independent of regulatory requirements.
- There are no significant environmental impacts that cannot be mitigated.
- There is widespread public acceptance of the alternative components.

Any alternative that can be developed by SCWA without participation by other water supply or governmental agencies is easier to implement. Also, any alternative consisting of well-defined components avoids time delays devoted to establishing component configuration.

In addition to the regulatory impact on treatment processes, permits to construct, implement, and operate various components may be required from numerous local, regional, state, and federal governmental agencies: the City and County of Sacramento, utility companies, RWQCB, SWRCB, the California Division of Safety of Dams, Caltrans, Department of

Fish and Game, DHS, Fish and Wildlife Service, the Army Corps of Engineers (USACE), Reclamation, and others. The effort required for numerous permits increases the difficulty of implementing an alternative.

Environmental Feasibility

Acceptable alternatives should not have any major environmental impacts or significant mitigation costs. Environmental impacts that require significant environmental mitigation will require adequate lead time to develop acceptable mitigation measures. Such measures must be negotiated with governmental agencies, concerned environmental organizations, and citizens groups.

Cost

A commitment to use SCWA funds or to bond will require that the alternative be cost effective. Such funds could be required to implement additional demand management/water conservation; purchase lands; pay for environmental mitigation; and construct treatment, storage, and conveyance facilities. In order to compare the economic efficiency of the three alternatives, planning level estimates of total capital costs were developed. The capital cost for each alternative was based largely on costs developed for the water supply and facility components described in **Section 5—Water Supply Sources and Facilities**. (Component construction costs are detailed in **Appendix G**.) All capital costs include 35 percent for engineering, administration, and contingency.

The unit costs developed for each alternative include annual O&M costs, raw water acquisition costs, and capital recovery costs. Raw water acquisition costs include the annual cost of purchasing raw water from the City of Sacramento, Reclamation, SMUD, or others as appropriate.

Capital recovery costs are based on an assumed average facility life of 40 years with a 5 percent discount rate. Although the facilities in the alternatives may have different life spans and the discount rate does not include an inflation rate, these variables should provide adequate information for comparison of alternatives. Once a preferred alternative is selected, a detailed financial analysis will be performed and the unit cost developed in this analysis will be refined as part of the financial analysis.

6.3.2 Alternative Evaluation

Each alternative was evaluated based on the factors described above and a “low,” “medium,” or “high” rating was given to each alternative for each of the non-economic evaluation fac-

tors. These ratings are defined as follows: a high rating represents a very favorable situation, a medium rating a moderately favorable situation, and a low rating a generally unfavorable situation. A low, medium, or high rating was then assigned to each of the non-economic evaluation categories (reliability, flexibility, implementability, and environmental feasibility).

Each alternative was also evaluated on cost effectiveness (total program cost). Common components to each alternative are groundwater capacity (which includes both new wells and treatment facilities) and recycled water. Each alternative requires surface water treatment and conveyance, and there are three surface water treatment facility options: SCWA Freeport WTP, Freeport Regional Water Project, and SCWA/City Joint Project. Costs have been developed for each of the alternatives and a preferred alternative selected.

Capital costs for each alternative are summarized in **Table 6-1**. The evaluation of each of the alternatives is described below and summarized in **Table 6-2**.

Alternative 1—SCWA Freeport WTP

This alternative relies primarily on a variety of surface water supplies (i.e., “Fazio,” SMUD 1 and 2, American River POU water, appropriative, and other water supplies) for direct supply. The potential shortages inherent with surface water supplies require that this alternative have redundancy in its facilities (i.e., groundwater production facilities). Because of the combined reliability of groundwater and surface water supplies, the overall reliability of this alternative is rated high. Based on the relative ease in phasing each of the facility components, and the potential for expansion of the facility components, the flexibility of this element is considered to be high. The overall implementability of this element is also rated high, primarily due to the high level of control that SCWA has over implementation. No significant environmental constraints were identified for this alternative.

Alternative 2—Freeport Regional Water Project

This alternative relies primarily on a variety of surface water supplies (i.e., “Fazio,” SMUD 1 and 2, American River POU water, appropriative, and other water supplies) for direct supply. The potential shortages inherent with surface water supplies require that this alternative have redundancy in its facilities (i.e., groundwater production facilities). The overall reliability of this alternative is rated high, primarily due to the combined reliability of groundwater and surface water supplies. The overall flexibility of this alternative is rated high. While portions of this alternative are completed in conjunc-

Table 6-1. Project Alternatives Cost Summary

Capital Facility	Alternative Capital Costs (\$ Million Dollars) ¹		
	1 SCWA Freeport WTP	2 Freeport Regional Water Project	3 SCWA/City Joint Project
Freeport Facilities	\$76	\$96	\$0
SCWA Water Treatment Plant	\$129	\$145	\$0
Sac River Water Treatment Plant Capacity	\$10	\$10	\$169
Regional Conveyance Facilities	\$42	\$29	\$105
Groundwater Production Facilities	\$180	\$180	\$180
Transmission Mains	\$97	\$100	\$102
Conservation	\$16	\$16	\$16
SCADA	\$2	\$2	\$2
Recycled Water	\$15	\$15	\$15
Surface Water Supplies	\$9	\$9	\$9
Total Capital Cost	\$576	\$602	\$598
Non-specific project costs ²	\$102	\$108	\$106
Total Program Cost	\$678	\$710	\$704

Notes: 1. Capital costs are 2002 dollars and include engineering, overhead, and construction contingency. These costs are inflated by the average of the Engineering News Record Construction Cost Index (ENR/CCI) for the 20 Cities and San Francisco. In 2002 the ENR/CCI was 7069. The ENR/CCI in 2004 was 7306.

2. Non-specific project costs is 18 percent of the capital cost.

tion with EBMUD, the overall implementability of this element is rated high due to the high level of control that SCWA will retain over implementation. No significant environmental constraints were identified for this alternative.

Alternative 3—SCWA/City of Sacramento Joint Project

This alternative relies primarily on a variety of surface water supplies (i.e., “Fazio,” SMUD 1 and 2, American River POU water, appropriative, and other water supplies) for direct supply. The potential shortages inherent with surface water supplies require that this alternative have redundancy in its facilities (i.e., groundwater production facilities). The overall reliability of this alternative is high, primarily due to the combined reliability of groundwater and surface water supplies. The overall flexibility of the alternative was rated low, because many aspects of the project will be dictated by the needs of the City (i.e., plant expansion/phasing constraints, pipeline routing constraints, etc.). The implementability of this alternative was rated low, primarily due to the many unknowns and constraints associated with routing and constructing large diameter pipelines through downtown Sacramento. No significant environmental constraints were identified for this alternative.

6.4 SELECTED ALTERNATIVE

Based on the alternative evaluation as summarized in **Table 6-2**, Alternative 2—Freeport Regional Water Project is selected as the preferred alternative for the purpose of preparing a financial analysis and defining a water management program for this WSMP.

6.5 PHASING OF WATER SUPPLY FACILITIES

The discussion below describes the phasing of the specific components of the preferred alternative. In general, the phasing of these components has been developed to match (or exceed) projected water demands. Projected 2030 water demands can be found in **Table 2-2** and are assumed to increase linearly from the present (2002) to the County General Plan build-out (2024), and at a slightly lesser linear rate from the County General Plan build-out to WF build-out (2030). The projected buildup of maximum day demands in Zone 40 is presented in **Figure 2-4**.

Implementation of some of the recycled and surface water components of the preferred alternative are constrained by the availability of either the water sources or the facilities necessary to treat and convey the water. Additionally, because of potential deficiencies in surface water supplies in dry and critically dry years (up to 50 percent for SMUD 1 and 2 and “Fazio” water, and up to 100 percent for Appropriative water), groundwater production facilities are phased to provide adequate production capacity under minimum surface water delivery conditions. A recommended implementation schedule of surface water and recycled water facilities for the preferred alternative is presented in **Table 6-3** and discussed below.

Surface Water

Based on CALSIM II modeling completed for the Freeport Regional Water Project, SCWA needs to secure surface water entitlements from a variety of supply sources including: “Fazio” water, SMUD 1 and 2 water, Appropriative water, and Other Water Supplies including American River POU water

Table 6-2. Alternatives Evaluation Summary

Alternative	Evaluation Factors				
	Reliability	Flexibility	Implementability	Environmental Feasibility	Cost Effectiveness
Alternative 1 – SCWA Freeport WTP	High	High	High	Medium	\$678 M
Alternative 2 – Freeport Regional Water Project	High	High	High	Medium	\$710 M
Alternative 3 – SCWA/City Joint Project	High	Low	Low	Medium	\$704 M

2002 dollars ENR/CCI 7069

and other water transfers. Surface water will be treated at a new surface water treatment facility constructed by SCWA with an ultimate treatment capacity of 85 mgd. Up to 11 mgd of surface water (non-guaranteed) will be conveyed to the 2030 study area through the “Franklin Intertie” with the City of Sacramento.

The surface water supply component of the selected alternative will also require the installation of a number of water transmission lines necessary to maximize the use of surface water throughout the 2030 study area. Phasing for these pipelines can be found in **Table 6-3**.

Groundwater

Groundwater production capacity is based on the ability to meet maximum day demands in the driest years when all surface water supplies are significantly reduced. Based on CALSIM II modeling, the maximum groundwater production capacity needed is approximately 160 mgd. **Figure 6-4** illustrates the exceedance plot of groundwater use under the CALSIM II modeling.

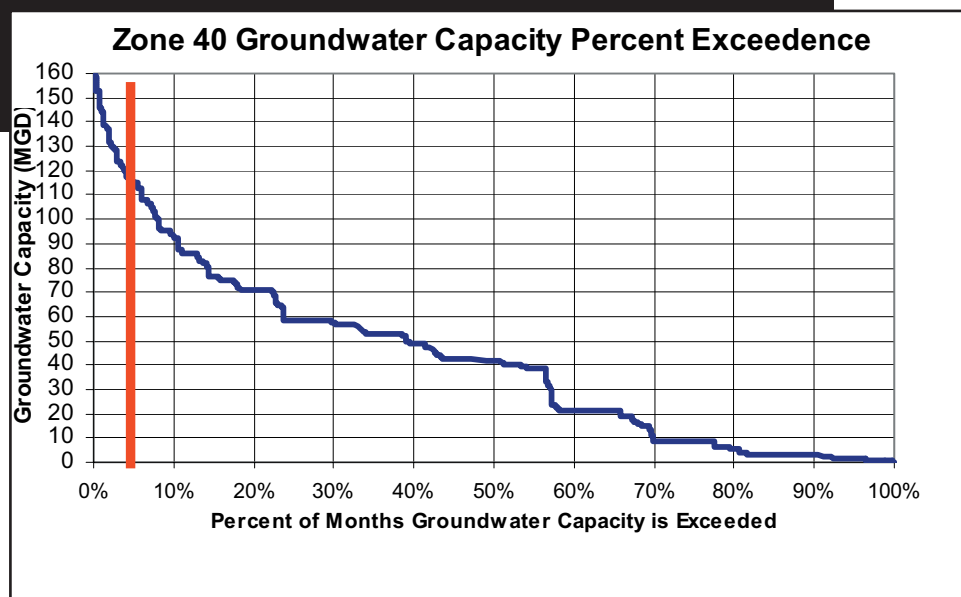
Figure 6-4 illustrates the need for groundwater capacity over 73 years of historical hydrologic conditions. The plot indicates that in some months up to 160 mgd of groundwater capacity would be needed to meet Zone 40 demands. SCWA believes that capturing 95 percent of the years (with groundwater capacity at approximately 126 mgd) will meet 2030 maximum day demands and provide adequate water supplies when surface water availability is reduced during dry and critically dry years.

During these years, the remaining five percent of demand can be made up with demand reduction programs and operational changes in system pressures.

Groundwater will also require treatment for iron and manganese (and possibly radon and arsenic depending on future drinking water regulations and levels of each constituent found in the water). Typically, groundwater treatment is provided at 10-mgd treatment plants served by approximately six wells.

There is more flexibility in implementing groundwater facilities than surface water or recycled water facilities. SCWA has more control over the design and construction of groundwater facilities and can phase these on an “as needed” basis. For planning purposes, the phasing of groundwater facilities has been assumed to occur in 2-mgd increments to match increases in system demand. Based on the projected increase in maximum day demands and the construction of recycled and surface water treatment facilities (in the years 2003 and 2010, respectively), additional groundwater production and treatment facilities will be required throughout the planning period as shown in **Figure 6-5**. The phasing of groundwater facilities faces several constraints. First, the ability to serve development in advance of the construction of surface water treatment facilities and the extension of conveyance facilities to deliver water to these areas. Second, is providing increased reliability in the water system in dry and critically dry years when surface water supplies are constrained. Third, the purchase of land for wells and groundwater treatment plants generally occurs as part of the tentative map approval. This provides an opportunity to begin construction early so that it minimizes public disruption in soon-to-be populated areas.

Figure 6-4. Groundwater Facility Capacity Needs Exceedance Graph



Based on these constraints, SCWA plans to construct the majority of their groundwater facilities early-on to provide the highest level of reliability. Once surface water is fully integrated into the distribution system, groundwater facilities will provide the level of redundancy necessary to fully implement the WSMP's conjunctive use plan. The size and quantity of groundwater facilities is based on meeting maximum day demands under minimum surface water availability conditions (i.e., 50 percent deficiency for SMUD 1 and 2 and "Fazio" water, and reductions in other water supplies and appropriate water supplies).

Recycled Water

The preferred alternative includes approximately 4,400 AF/year of recycled water from SRCSD for landscape irrigation in portions of the Laguna, East Franklin, and Laguna Ridge areas. This project is part of a 10-mgd Urban Use project being implemented by the SRCSD. The first phase of this project started operating in mid-2003.

Transmission and Storage System

Transmission and storage system requirements for the WSMP are based on a computerized system model (H2ONet) and are part of the WSIP. Modeling criteria for the transmission system includes the following:

- Head loss through the pipes should not exceed 5 feet of head loss per 1,000 feet of pipe.
- Water velocities within the pipe should not exceed 7 feet per second, except for very short reaches of pipe.

- The pressure at which surface water can be boosted should not exceed 90 psi.
- Pressure should be maintained at all points in the system at or above 40 psi.

Because water supply in Zone 40 is a combination of groundwater and surface water, the transmission system has been sized to accommodate both sources and includes over 250,000 feet of pipe. A schematic of the build-out transmission system can be seen in **Figure 5-2**.

Storage facilities are sized to meet peak hour, emergency, and fire flow demands. Criteria to determine system wide storage requirements include the following:

- Four hours of peak hour demand minus the maximum day demand
- Fire storage of 3,000 gpm for three hours at each storage facility
- Emergency storage volume of 1/3 the average day demand

Based on modeling results, 17 to 24 additional storage facilities will be required in Zone 40. These facilities will have storage capacities of approximately 0.35 to 7 million (M) gallons for a total storage capacity of approximately 70 M gallons. A schematic showing the location of the build-out storage requirements can be seen in **Figure 5-2**.

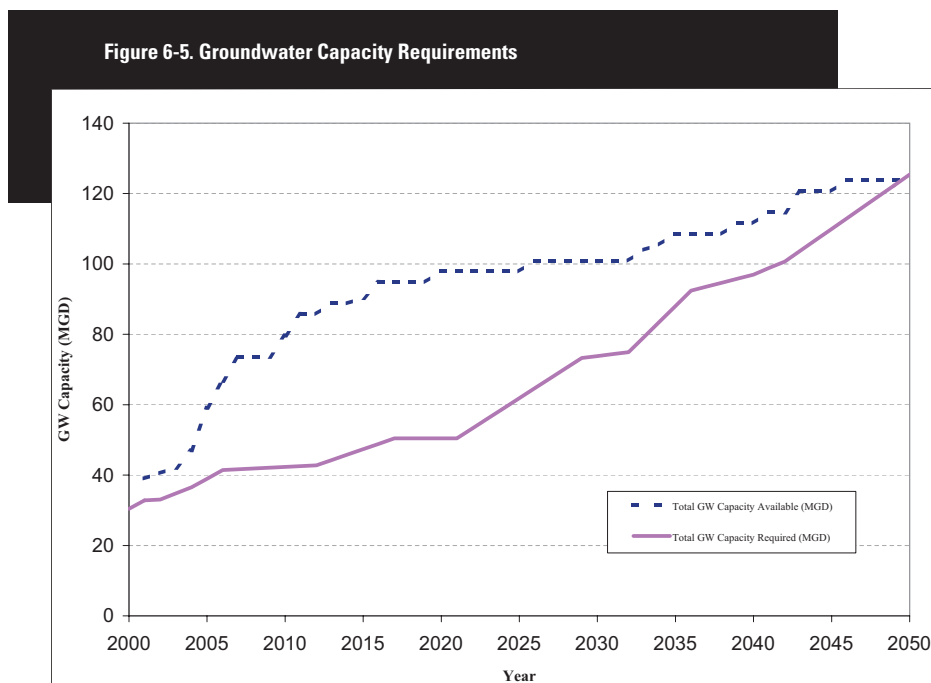


Table 6-3. Surface and Recycled Water Project Phasing Summary

<i>Capital Facility</i>	<i>Facility ID</i>	<i>Project</i>	<i>Description</i>	<i>Participating Agency(s)</i>	<i>Distance</i>	<i>Capacity</i>
Phase 1 Projects (2002-2007)						
RCF	CP-01	Franklin Intertie to Dwight Rd WTP	Water transmission main (24-inch)	City/SCWA	1.6 miles	5 MGD
RCF	CP-04	Excelsior & Florin Rd to Anatolia WTP	Water transmission main	SCWA	5.6 miles	10 MGD
RCF	CP-06	Florin Reservoir to North Vineyard Station WTP	Water transmission main	City/SCWA	2 miles	19 MGD
FF	JCP-01	Diversion Structure to Gerber & Vineyard Rd	Raw water transmission main	SCWA/EBMUD	14 miles	185 MGD
FF	Intake	FRWP – Diversion Structure	Diversion structure on Sacramento River	SCWA/EBMUD	n.a.	185 MGD
RW	Recycled Water	Recycled Water Phase 2	Pipelines, storage, and booster facilities	SCWA/SRCSD	n.a.	7 MGD
Phase 2a Projects (2007-2019)						
RCF	CCP-01	Gerber & Vineyard Rd to Central WTP	Raw water transmission main	SCWA	1 mile	85 MGD
RCF	CCP-02	Central WTP to Florin & Bradshaw Rd	Water transmission main	SCWA	1 mile	35 MGD
RCF	CCP-03	Florin & Bradshaw Rd to Calvine Rd	Water transmission line	SCWA	3 miles	15 MGD
RCF	CP-02a	Central WTP to Florin & Excelsior Rd	Water transmission line	SCWA	1 mile	35 MGD
RCF	CP-02b	Florin & Excelsior Rd north on Excelsior Rd	Water transmission line	SCWA	1 mile	15 MGD
SCWA WTP	Central WTP	Central WTP Phase 1	30 MGD of treatment plant capacity	SCWA	n.a.	30 MGD
RW	Recycled Water	Recycled Water Phase 2	Pipelines, storage, and booster facilities	SCWA/SRCSD	n.a.	7 MGD
Phase 2c Projects (2021-2030)						
SCWA WTP	Central WTP	Central WTP Phase 2	30 MGD of treatment plant capacity	SCWA	n.a.	60 MGD
Phase 3 Project (2030-2040)						
RCF	CP-02c	Central WTP to Florin & Excelsior Rd	Water transmission line	SCWA	0.85	10 MGD
RCF	CP-05	Florin & Excelsior Rd to Sunrise Blvd	Water transmission line	SCWA	6.7	10 MGD
SCWA WTP	Central WTP	Central WTP Phase 3	25 MGD of treatment capacity	SCWA	n.a.	185 MGD

1. RCF – Regional Conveyance Facilities
2. FF – Freeport Facilities
3. SCWA WTP – Sacramento County Water Agency Water Treatment Plant Capacity
4. RW – Recycled Water

Financial Analysis





This section provides background information on the Zone 40 Development Fee and User Fee Program, evaluates the preferred alternative consistent with the Feasibility Report, describes the Zone 40 Development Fee Program and how capital projects are funded, and provides a clear methodology for calculating the Zone 40 development fee and state requirements for any additional bonding.

FINANCIAL ANALYSIS

7.1 INTRODUCTION

The financing plan for the 2030 study area is based on the capital improvements required to implement the selected alternative. Historically, Zone 40 has paid for these improvements using a “pay-as-you-go” system where facilities are constructed by SCWA or by a developer (and reimbursed by SCWA). With developer constructed facilities, payment (reimbursement) is made through fee credits where the credit amount is deducted from the amount of fees owed, or through a direct reimbursement process upon acceptance of the facilities by SCWA. SCWA constructed facilities, such as groundwater treatment plants, have historically been paid for through accumulated reserves.

7.2 FINANCIAL BACKGROUND

Zone 40’s two revenue sources for capital improvements are a development fee and a user/service fee. The development fee is a one-time charge levied against new development. The user/service fee is a monthly fee that is charged to all customers in the Zone 40 service area. Revenue for Zone 40 is authorized through Ordinance No. 18, and Title 3 of the SCWA Code which provides for the collection of development fees and the user/service fee, respectively.

The equivalent dwelling units (EDU) development fee is calculated for each customer connection based on the size of the water meter. Funds collected go towards construction for all Zone 40 water facilities necessary to deliver surface water and groundwater. The acreage development fee portion is paid only by commercial connections to fund facility capacity required for higher levels of commercial fire protection.



Per Section 67 of Ordinance 18, the development fee is adjusted annually for inflation; the index is the average Engineering News Record Construction Cost Index for San Francisco and the 20 Cities as published in the January edition of the Engineering News Record each year. The development fee can also be increased in response to new programs or design standards that increase the total capital cost of system facilities. A plot of development fees vs. time is shown in **Figure 7-1**.

7.2.1 Development Fees

Development fees are based on EDUs and, for commercial users, acreage of developed land area. All residential and commercial developers pay a portion of the development fee when improvement plans are submitted for review and the remaining portion at the time a water connection and building permit are issued. **Figure 7-2** illustrates the revenue stream for construction of new capital facilities.

Figure 7-1 illustrates the increase in the development fees over time. The acreage fee has only increased as a result of inflation. In March 1990, the EDU development fee was increased to account for groundwater treatment requirements. Then, from 1998 through 2000, the EDU development fee underwent significant increases to pay for costs related to the following:

- land acquisition
- deep well construction
- surface water acquisitions
- outside services related to billing and mapping
- changed assumptions in revenue sources
- demand management/water conservation
- System Control and Data Acquisition (SCADA) systems used to automate operations of water facilities
- recycled water systems
- lost revenues from the Sacramento County Fee Deferral and Waiver Program.

Figure 7-1. Development Fee History

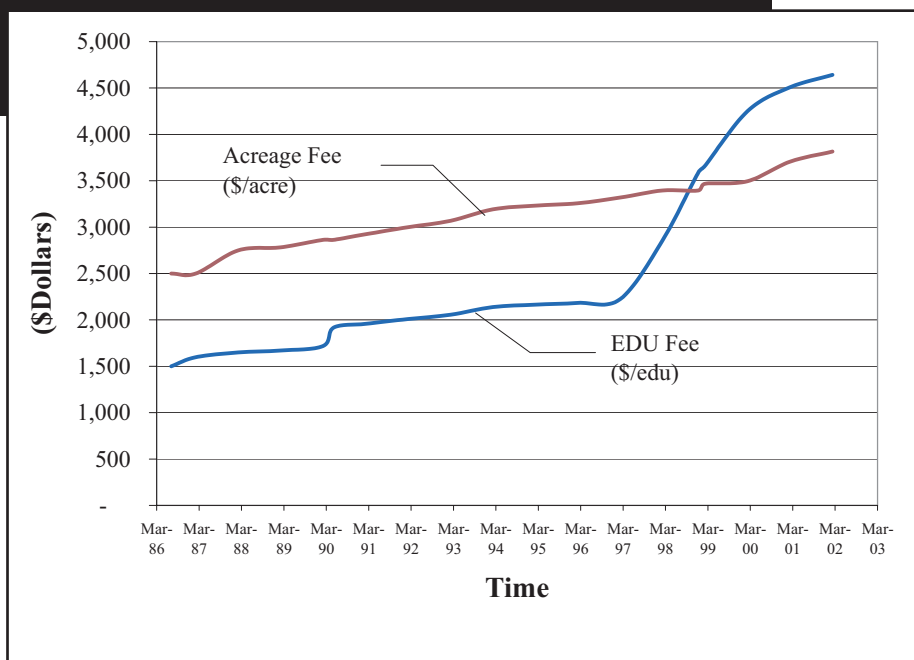


Table 7-1. 5-Year Capital Improvement Project (CIP) List

Revenue Sources				Project No.	5-Year CIP Projects Only	Capital Facilities	Totals	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	
SCWA Bond 1	FRWA Bonds	SCWA Bond 2	PAYG											
				CN-1	Water Meters	Conservation	\$9,090	\$1,515	\$1,515	\$1,515	\$1,515	\$1,515	\$1,515	
				RP-1	Treated Water Pipeline from Franklin to Dwight (CP-01)	Regional Conveyance Facilities	\$1,539	\$13	\$158	\$456	\$608	\$304	\$-	
				RP-2	Vineyard Area Treated Water Pipeline -West (CP-02)		\$-	\$-	\$-	\$-	\$-	\$-	\$-	
				RP-3	Vineyard Area Treated Water Pipeline -East (CP-03)		\$-	\$-	\$-	\$-	\$-	\$-	\$-	
				RP-4	Eagles Nest Treated Water Pipeline (CP-04)		\$-	\$-	\$-	\$-	\$-	\$-	\$-	
				RP-5	Sunrise Treated Water Pipeline (CP-05)		\$-	\$-	\$-	\$-	\$-	\$-	\$-	
				RP-6	Booster Pumps for Pressure Zone Control		\$168	\$28	\$28	\$28	\$28	\$28	\$28	\$28
				RP-7	Treated Water Pipeline From Central WTP South (CCP-03)		\$73	\$-	\$-	\$-	\$15	\$29	\$29	
				GW-1	East Elk Grove WTP (EG)	Groundwater Production Facilities	\$3,322	\$-	\$1,234	\$1,661	\$427	\$-	\$-	
				GW-2	Lakeside WTP (LS)		\$1,234	\$-	\$-	\$-	\$617	\$617	\$-	
				GW-3	Calvine Meadows WTP (CM)		\$-	\$-	\$-	\$-	\$-	\$-	\$-	
				GW-4	East Park WTP (EP)		\$-	\$-	\$-	\$-	\$-	\$-	\$-	
				GW-5	Dwight WTP (DW)		\$2,088	\$427	\$427	\$617	\$617	\$-	\$-	
				GW-6	Sheldon WTP (SH)		\$-	\$-	\$-	\$-	\$-	\$-	\$-	
				GW-7	Wild Hawk WTP (WH)		\$9,766	\$421	\$3,058	\$3,058	\$3,058	\$171	\$-	
				GW-8	Bond Road WTP (BR)		\$1,502	\$-	\$334	\$334	\$834	\$-	\$-	
				GW-9	Poppy Ridge WTP (PR)		\$16,486	\$3,188	\$4,849	\$4,849	\$1,872	\$617	\$1,111	
				GW-10	Laguna Ridge WTP (LR)		\$2,200	\$250	\$250	\$-	\$850	\$850	\$-	
				GW-11	Franklin WTP (w/ Recycled Water Storage) (FR)		\$3,027	\$706	\$206	\$576	\$370	\$-	\$1,169	
				GW-12	Big Horn WTP (BH)		\$5,242	\$-	\$500	\$1,375	\$1,375	\$1,375	\$617	
				GW-13	Eagles Nest Storage Tank (EN)		\$423	\$141	\$141	\$141	\$-	\$-	\$-	
				GW-14	Sunrise Douglas WTP (SD)		\$333	\$-	\$333	\$-	\$-	\$-	\$-	
				GW-15	Anatolia WTP (Off-site Well Field)(AN)		\$11,032	\$-	\$1,764	\$2,317	\$2,317	\$2,317	\$2,317	
				GW-16	North Vineyard Station WTP (NV)		\$500	\$-	\$500	\$-	\$-	\$-	\$-	
				RC-1	Recycled Water (1998 to 2003)	Recycled Water	\$91	\$58	\$33	\$-	\$-	\$-	\$-	
				RC-2	Recycled Water Storage and Pumps		\$6,755	\$41	\$862	\$1,684	\$1,684	\$1,663	\$821	
				RC-3	Recycled Water Pipelines		\$3,252	\$542	\$542	\$542	\$542	\$542	\$542	
				TM-1	Transmission Mains (i.e., Reimbursement/Credit Projects)	Transmission Mains	\$21,871	\$3,623	\$3,852	\$3,620	\$3,592	\$3,592	\$3,592	
				SD-1	SCADA	SCADA	\$294	\$49	\$49	\$49	\$49	\$49	\$49	
				OT-1	SMUD 2	Surface Water Supplies	\$198	\$-	\$22	\$44	\$44	\$44	\$44	
				OT-2	SRWTP Non Firm Capacity	SRWTP Capacity	\$4,925	\$675	\$675	\$675	\$850	\$1,025	\$1,025	
				CIP Subtotal			\$105,411	\$11,677	\$21,332	\$23,541	\$21,264	\$14,738	\$12,859	
				FP-1	Treated Water Pipeline From Central WTP North (CCP-02)	Freeport Facilities and SCWA Central WTP	\$1,044	\$-	\$30	\$60	\$60	\$60	\$834	
				FP-2	Intake at Freeport Diversion		\$33,047	\$529	\$529	\$5,552	\$10,575	\$10,575	\$5,287	
				FP-3	Intake and Raw Water Development		\$3,600	\$-	\$1,800	\$1,800	\$-	\$-	\$-	
				FP-4	Raw Water Line from Freeport intake to Central WTP (JFCP-01)		\$49,613	\$591	\$1,181	\$12,403	\$23,625	\$11,813	\$-	
				FP-5	Freeport Pre-Design ROW Acquis		\$2,310	\$18	\$1,137	\$1,137	\$18	\$-	\$-	
				FP-6	Central WTP		\$31,352	\$-	\$713	\$713	\$713	\$10,213	\$19,000	
				FP-7	Raw Water Line to Central WTP (CCP-01)		\$2,788	\$64	\$129	\$129	\$129	\$129	\$2,208	
				Freeport/Central WTP Capacity Subtotal			\$123,754	\$1,202	\$5,519	\$21,794	\$35,120	\$32,790	\$27,329	
				CIP Total			\$229,165	\$12,879	\$26,851	\$45,335	\$56,384	\$47,528	\$40,188	
				Non-Specific Project Costs			\$14,079	\$2,116	\$2,116	\$2,116	\$2,393	\$2,669	\$2,669	
				Existing Reimbursement and Credit Agreements			\$21,871	\$3,623	\$3,852	\$3,620	\$3,592	\$3,592	\$3,592	
				Total SCWA Costs			\$265,116	\$14,994	\$28,968	\$47,450	\$58,776	\$50,197	\$42,859	
				Revenue Sources										
				Total Bond 1 Projects			\$46,690	\$5,994	\$10,352	\$11,578	\$8,311	\$5,862	\$4,593	
				Total Bond 2 Projects			\$33,525	\$1,518	\$6,586	\$7,801	\$8,804	\$4,713	\$4,103	
				FRWA/SCWA Bonds			\$123,754	\$1,202	\$5,519	\$21,794	\$35,120	\$32,790	\$27,329	
				Total Pay as You Go Costs			\$61,147	\$9,903	\$10,363	\$9,897	\$10,135	\$10,425	\$10,425	
				Total Bonded and Pay as You Go			\$265,116	\$18,617	\$32,820	\$51,070	\$62,370	\$53,790	\$46,450	

In May 2003, the consulting firm MWH prepared a comprehensive evaluation of the Zone 40 capital improvement financing program to support the sale of Sacramento County Water Financing Authority Revenue Bonds. This Feasibility Report for 2003 Sacramento County Water Financing Authority Revenue Bonds (SCWA Zones 40 and 41 Water System Projects) - the "Feasibility Report" - concluded that significant Zone 40 development fee increases were required.

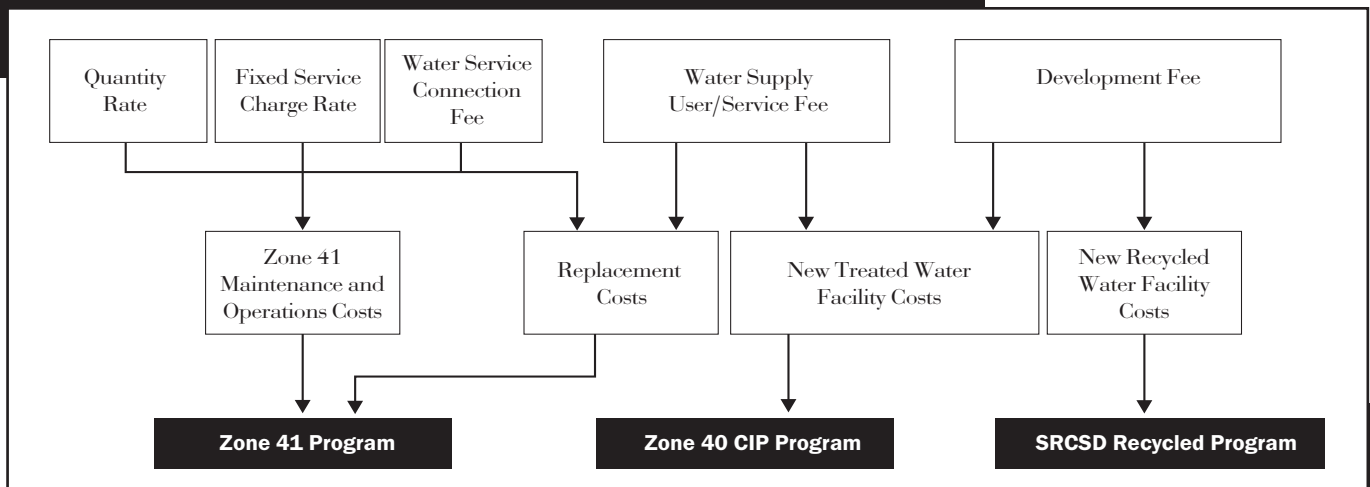
These fee increases will fund a comprehensive Capital Improvements Program (CIP) that includes facilities associated with the conveyance and treatment of surface water, an increase in groundwater facilities to provide redundant supply during dry year shortages in surface water, and facilities required for recycled water.

7.2.2 User/Service Fee

The user/service fee is a monthly charge for domestic services and for commercial and other services is a percentage of the metered monthly charge. The user/service fee is used in tandem with the development fee to finance the construction of major water supply infrastructure required to meet current and future water demands in the Zone 40 service area. Per the terms of the Recycled Water Agreement between SRCSD and SCWA, part of the user/service fee collected from recycled water customers is transferred to SRCSD for funding of the tertiary treatment facilities.

When authorized, the user/service fee was set at \$5 per month for residential services and 33-percent of the metered commercial/industrial monthly charge. The user/service fee was increased to \$5.50 per month for residential services in 2002. Ordinance WAO-0048, approved August 13, 2003, amended Title 3 Chapter 3.50 of the SCWA Code to include the user/service fee, removing it from Ordinance No. 18. This same action increased the user/service fee to \$7 per month for residential services.

Figure 7-2. Conceptual Financial Model



The Feasibility Report concluded that increases in the user/service fee would be required. As with the development fee, the proposed increases will fund a portion of Zone 40's CIP.

7.3 FINANCIAL PLANNING

The process of financial planning considers many variables, some within the control of SCWA and others that are not. New development requires the construction of new water facilities to meet immediate water demands. However, at the same time, SCWA must also secure and deliver surface water as part of Zone 40's long-term conjunctive use program. Planning for new growth and planning for large-scale surface water deliveries affects the timing of facility construction relative to available revenue. The amount of revenue generated as growth occurs is insufficient to fund the construction of large surface water projects and therefore debt financing is a necessary component of a planned water supply system.

In order to assist in a comparative evaluation of various financing options, estimates of probable capital costs have been developed for the preferred water supply alternative. Capital costs are examined based on the following assumptions:

1. Total capital costs are in 2002 dollars.
2. Methods of payment for new capital facilities can be through pay-as-you-go, debt financing, developer reimbursement agreements, and developer development fee credit agreements.
3. Sources of revenue include monies collected through the development fee program, the user/service fee program, and any bond financing issuances. State and Federal Grants may also be used if they become available; however, for purposes of financial planning, no grant monies are included as a revenue source.
4. The total cost over the planning period includes the cost of bonded debt.

7.3.1 Steps Taken in Developing Capital Cost Estimates

Step 1: Develop detailed CIP for the next 5 years.

In 2003, SCWA and MWH developed a projected 5-year CIP list for the Feasibility Report that includes all surface water, groundwater, storage, recycled water, and other ancillary costs. A detailed breakdown of costs and sources of revenue and/or programs to pay for each project is listed in **Table 7-1**. A map

showing the approximate location of these facilities is shown in **Figure 7-3** and **Figure 7-4**.

The cost estimate for each of the facilities listed is based on similar facilities constructed in the Sacramento area during the last five years or on engineers' estimates. Costs are adjusted to account for inflation from the time of construction to the present.

Over the next five years, approximately \$243 M will be spent on the various capital facility categories shown in **Table 7-1**. These include:

- Conservation
- Regional Conveyance Facilities
- Groundwater Production Facilities
- Recycled Water
- SCADA
- Other Surface Water Supplies
- SRWTP Capacity
- Freeport Facilities
- SCWA WTP

The split in costs are \$80.2 M, \$123.7 M, and \$61.2 M, for SCWA Bonds, Freeport Regional Water Authority (FRWA) /SCWA Bonds, and pay-as-you-go, respectively. **Figure 7-3** displays this cost split.

Step 2: Insure Consistency with the Feasibility Report

The Feasibility Report provides a detailed breakdown of estimated costs over the next four years of the Zone 40 Capital Program. The breakdown considers only the projects that will be funded through the bond proceeds. **Table 7-1** provides a list of the bonded projects as well as all other projects proposed under the Zone 40 CIP for the next five years. Table 4-1 of the Feasibility Report identifies the total 2003 Bond (i.e., Bond 1) to be \$49,046 and assumes a 3 percent annual inflation rate. Comparing this with **Table 7-1**, there is the need to normalize the amount of the Feasibility Report to 2002 dollars or \$44,884 ($\$49,046 / (1 + .03)^3$). If the 2003 Bond amounts for the first four years are totaled, the approximate amount of the bond is \$44,000. Small differences exist due to small variances in timing of monies for certain projects.

Figure 7-3. 5-Year CIP Groundwater and Surface Water Facilities

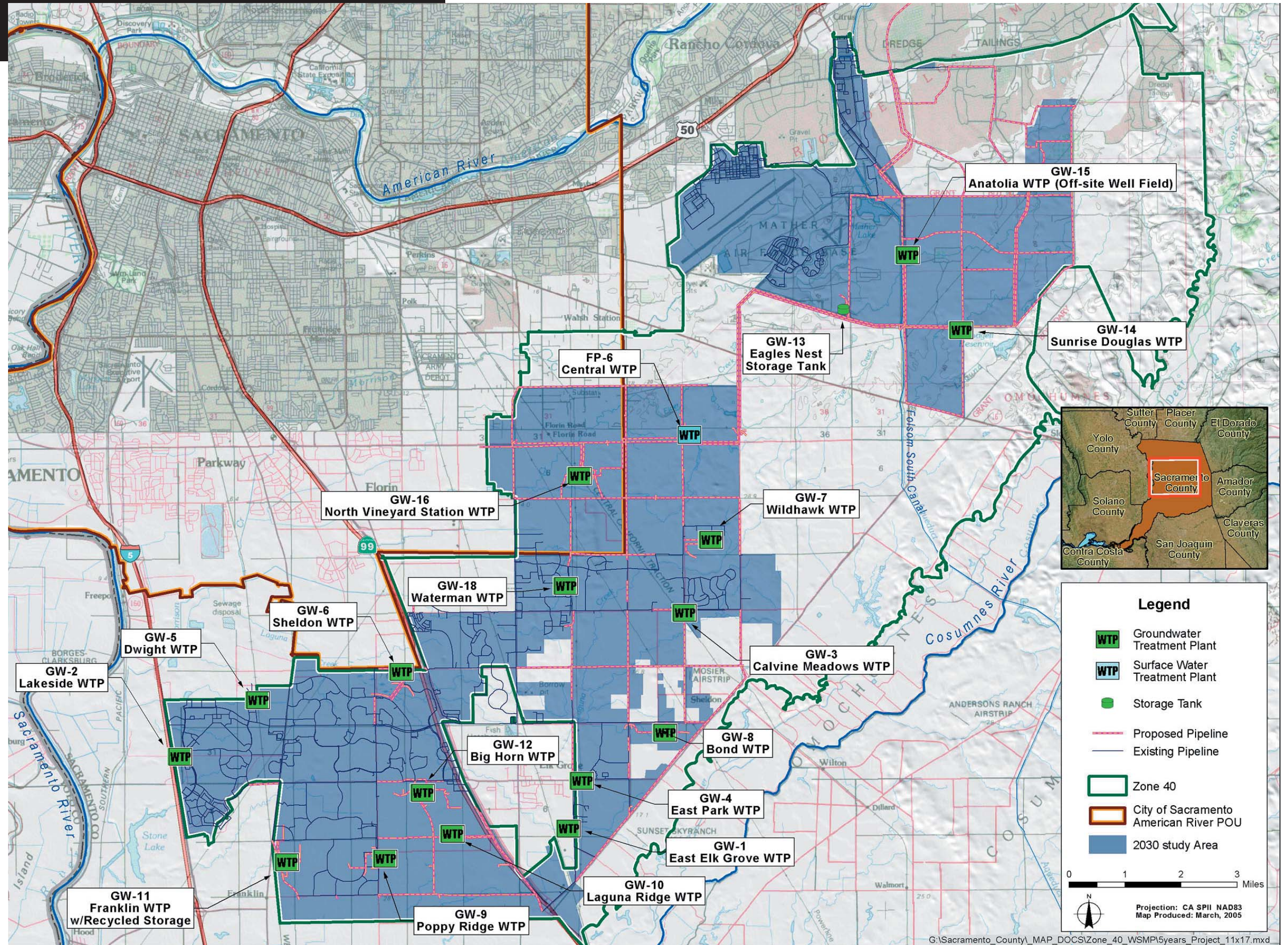


Figure 7-4. 5-Year CIP Recycled Water Facilities

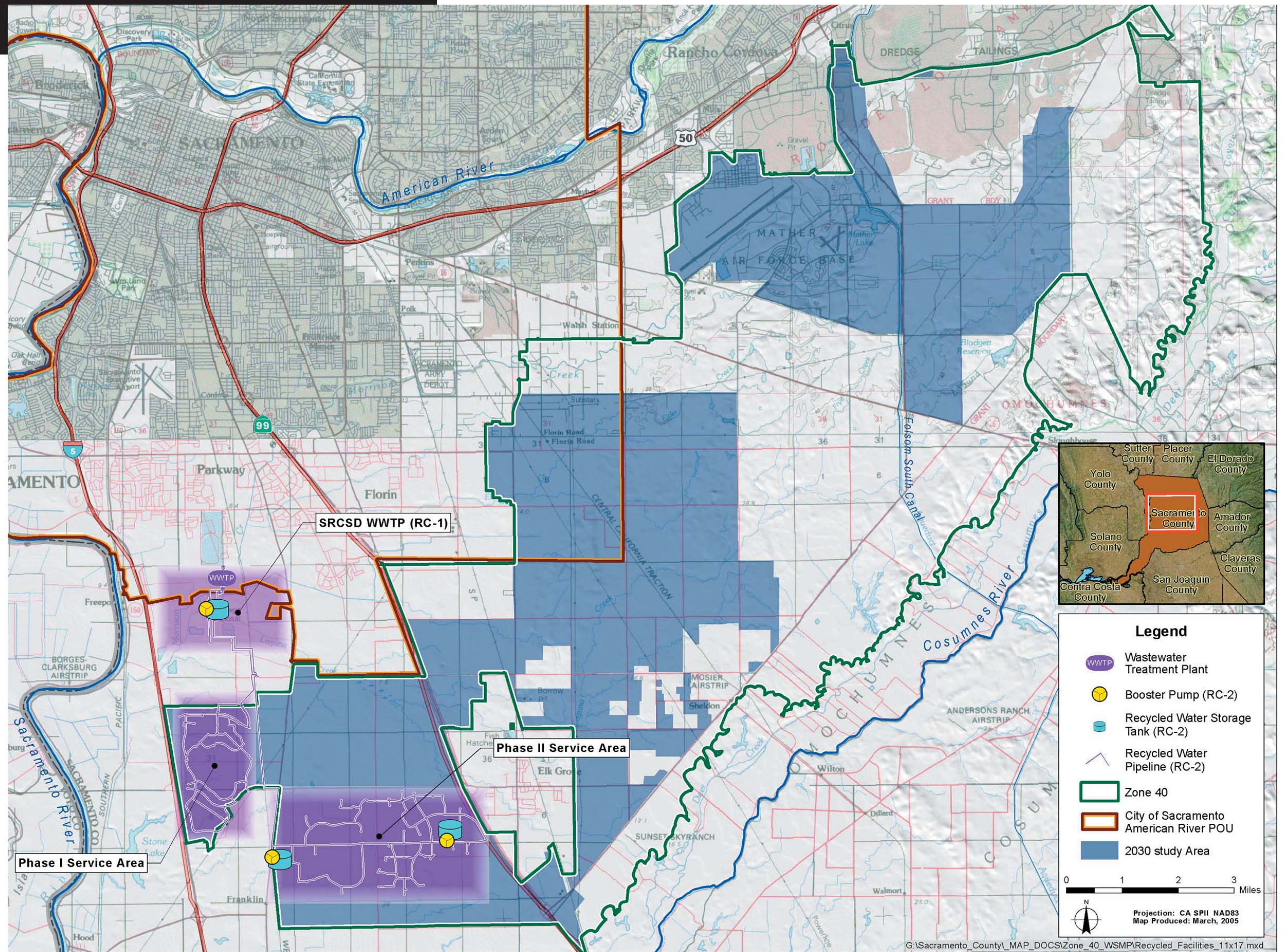
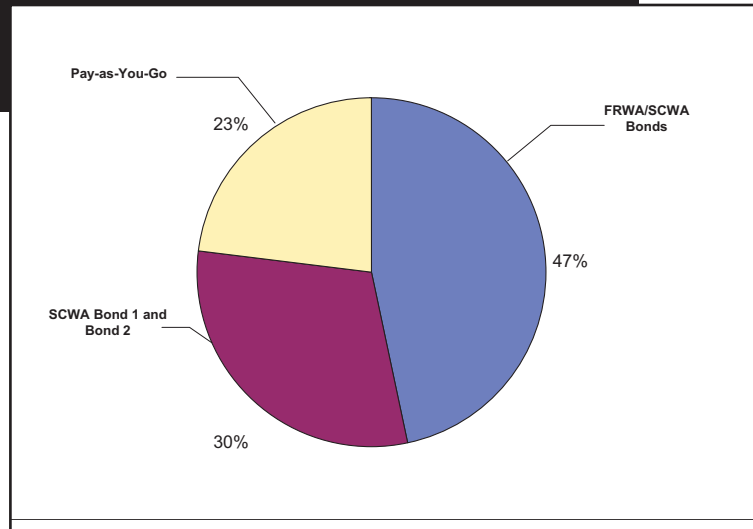


Figure 7-5. Split of 5-Year CIP Costs by Revenue Source



Step 3: Determine Overall Cost

The costs presented in **Table 7-2** are total capital costs in 2002 dollars for build out of Alternative 2-Freeport Regional Water Project and include a percentage breakdown of costs (see **Figure 7-6**) to illustrate how costs are split between the major capital elements for the 2030 study area.

The funding requirements of the preferred alternative are identified by spreading the proposed capital projects over a 50-year timeline, phased according to need. The 50-year timeline is used only as a financial tool to model a slower growth scenario than the planned 2030 build-out. A slower growth rate is considered to be more conservative relative to paying for facilities and bonded indebtedness. The facilities constructed over the 50-year timeline are identical to 2030 facilities described previously.

Modeling of Finances

The need for water facilities corresponds directly with increased water demands. For example, required groundwater capacity fluctuates in response to increases in surface water capacity and water demand. Therefore, the timing of surface water projects reflects the following goals: 1) maintain the long-term average sustainable groundwater yield; 2) meet development needs for water supply in a timely manner; and 3) stabilize rates and minimize development fees.

The financial model used in this analysis spreads the capital costs presented in **Table 7-2** over the 50-year planning period according to the phase diagram (**Figure 7-7**). Inputs to the

financial model include growth rates, inflation, cost of debt, bond amounts, development fees, and user/service fees. Each input is set according to current planning assumptions.

Use of debt financing allows for timely construction of needed facilities and spreads the cost over the entire planning period. For larger facilities, such as the surface WTP or major conveyance pipelines, SCWA cannot collect sufficient revenues in the timeframe needed without significantly increasing development and user/service fees. The financial model is used to run various debt financing alternatives that spread the capital costs over the 50-year planning period. **Figure 7-7** provides an example of expenditures and revenues over the 50-year planning period. The large revenue spikes depict the periodic issuance of bonds for debt financing of large capital projects. The first set of bonds (2003 Bonds) were issued in June 2003.

Figure 7-8 depicts Zone 40's reserve balance over the period to 2040 illustrating the cycling of the fund balance with the larger projects, and an end fund balance close to zero representing that monies collected over the planning period are spent. The end period is truncated to 2040 since very little project construction is taking place and the fund balance increases significantly. In the future, it is likely that there will be additional growth (i.e., more projects) or the development fee will be reduced to cover replacement costs and water system enhancements.

Feasibility Report

In the spring of 2003, Montgomery Watson-Harza prepared a comprehensive evaluation of the Zone 40 water development fee program to address changes to Zone 40's conjunctive use program identified in this WSMP. Changes included the pattern of water demand growth, treatment for water quality, expansion of the original service area, and the availability of potential sources of surface water.

The development fee is one indicator of an acceptable capital program. The fee should be comparable with the cost of developing water supplies in other neighboring communities. The planning assumptions used in this analysis are presented in **Table 7-3**. Growth rates are consistent with the level of growth seen in Zone 40 over the period from 1998 to the present and projected build-out at year 2050. The fee needed for three different Bond/Fee scenarios is presented in **Table 7-4**. The bond amounts and timing are the same in all three scenarios. The change is in the timing of development fee increases and the retirement of the user/service fee that will likely be converted to some form of capital replacement and rehabilitation fee for maintaining older water facilities.

- Scenario 1 includes a single-phase increase in the Development Fee resulting in a 56% increase in fees in 2004.
- Scenario 2 includes a two-phased increase in the Development Fee resulting in a 59% increase in fees over the years 2004 and 2005.
- Scenario 3 includes a three-phased increase in the Development Fee resulting in a 87% increase in fees over the years 2004, 2005, and 2006.

Figure 7-6. Breakdown of Zone 40 Capital Costs

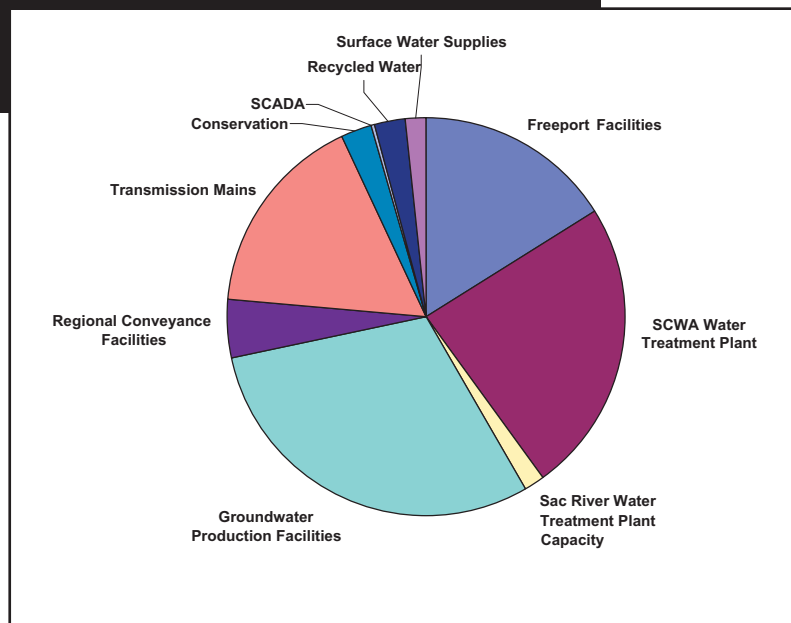


Table 7-2. Total Capital Cost Estimates for Alternative 2- Freeport Regional Water Project

<i>Cost Item</i>	<i>Total Capital Cost (2002 Dollars)</i>	<i>Percentage Breakdown</i>
Freeport Facilities	\$96,431,000	13.6%
SCWA Water Treatment Plant	\$144,912,000	20.4%
Sac River Water Treatment Plant Capacity	\$10,390,000	1.5%
Groundwater Production Facilities	\$180,226,000	25.3%
Regional Conveyance Facilities	\$28,774,000	4.0%
Transmission Mains	\$100,252,000	14.1%
Conservation	\$15,671,000	2.2%
SCADA	\$2,481,000	0.3%
Recycled Water	\$15,033,000	2.1%
Surface Water Supplies	\$9,303,000	1.3%
Non-specific Project Costs	\$107,851,000	15.2%
Total Capital Cost	\$711,324,000	100%

2002 dollars ENR/CCI 7069

Table 7-3. Financial Planning Assumptions

<i>Financial Assumptions</i>		
Bond Payment Interest	6.00%	
Bond Issue Costs	1.25%	
Inflation	3.00%	
Z40 Reserve & Bond Reserve Interest Earning	5.00%	
<i>Growth Assumptions</i>		
EDU Growth Rate (edu/year)	From 2000 to 2007	2,500
	From 2008 to 2050	2,000
Commercial Acreage Growth Rate (acres/year)	60	

Figure 7-7. Zone 40 Expenditures and Revenues Over 50-year Planning Period (Actual Year Dollars)

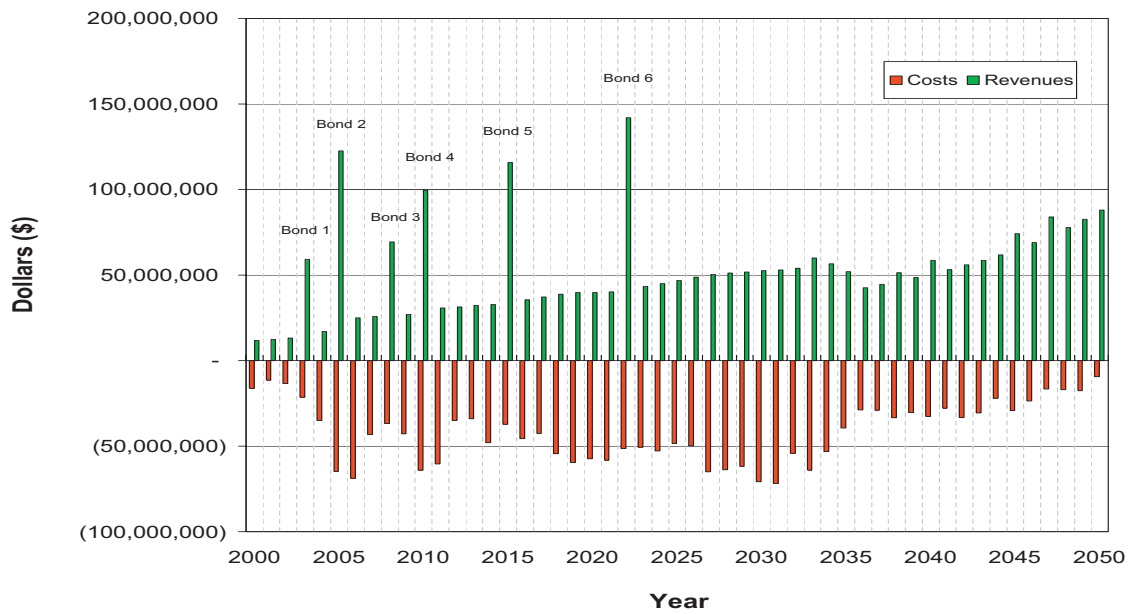


Figure 7-8. Zone 40 Reserve Balance Over Planning Period (Actual Year Dollars)

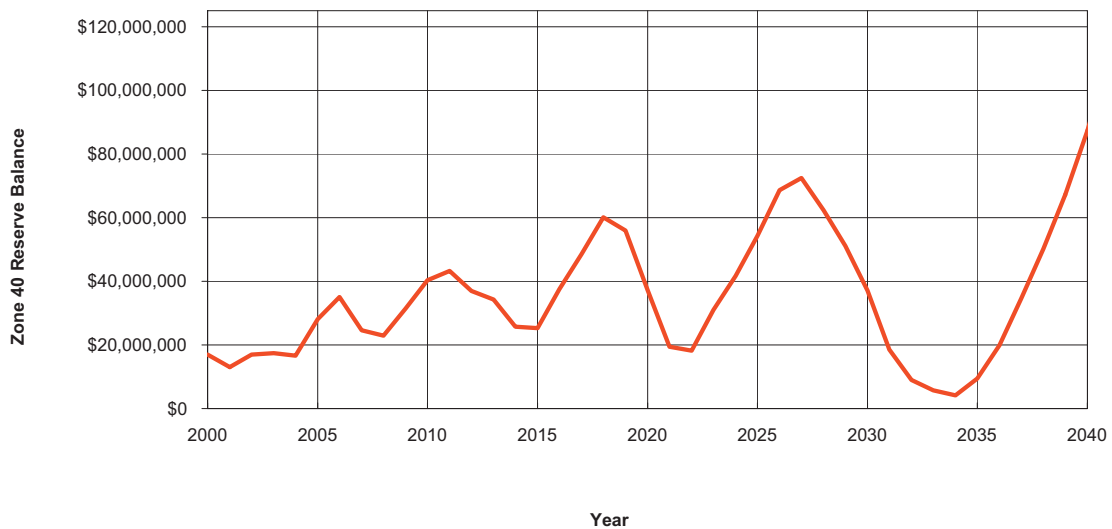


Table 7-4. Development Fee Comparison (2002 Dollars)

	<i>Bond/Fee Scenario 1</i>			<i>Bond/Fee Scenario 2</i>			<i>Bond/Fee Scenario 3</i>		
	Amount (\$)	Issuance Year	Term (Years)	Amount (\$)	Issuance Year	Term (Years)	Amount (\$)	Issuance Year	Term (Years)
<i>Bonded Debt</i>									
Bond 1	\$47,000,000	2003	30	\$47,000,000	2003	30	\$47,000,000	2003	30
Bond 2	\$100,000,000	2005	30	\$100,000,000	2005	30	\$100,000,000	2005	30
Bond 3	\$40,000,000	2008	30	\$40,000,000	2008	30	\$40,000,000	2008	30
Bond 4	\$60,000,000	2010	30	\$60,000,000	2010	30	\$60,000,000	2010	30
Bond 5	\$60,000,000	2015	30	\$60,000,000	2015	30	\$60,000,000	2015	30
Bond 6	\$60,000,000	2022	25	\$60,000,000	2022	25	\$60,000,000	2022	25
<i>Development Fee</i>									
Current Fee (2002)	\$4,641			\$4,641			\$4,641		
Needed Fee (Phase 1)	\$7,241	56%	2004	\$5,473	2004	18%	\$5,570	2004	18%
Needed Fee (Phase 2)	\$0			\$7,388	2005	35%	\$6,684	2005	18%
Needed Fee (Phase 3)	\$0						\$8,689	2006	15%
Overall Fee Increase (%)	56%			59%			87%		
<i>User Service Fee</i>									
Current Fee	\$5.50	2002		\$5.50	2002		\$5.50	2002	
Needed Fee	\$7.00	2003		\$7.00	2003		\$7.00	2003	
Needed Fee	\$7.70 ¹	2004		\$7.70 ¹	2004		\$7.70 ¹	2004	
User/Service Fee Expires	2034			2034			2034		

2002 dollars ENR/CCI 7069

Notes: 1. Increases by 10-percent through 2010-2011. The end rate in 2002 dollars is \$15.00 per month.

Implementation Plan



This section reviews the key steps in the implementation of Zone 40's conjunctive use capital program. Projects projected for construction over the next 10 years include surface water diversion facilities on the Sacramento River; large diameter raw water conveyance pipeline; the first phase of a surface WTP; large diameter treated water conveyance pipelines; groundwater treatment and storage facilities; and various transmission pipelines.

IMPLEMENTATION PLAN

8.1 INTRODUCTION

The implementation process for the next 10 years includes several steps, as shown in **Figure 8-1**. The FRWA, a Joint Powers Authority developed between SCWA and EBMUD, is currently pursuing a project to construct a diversion structure on the Sacramento River and a raw water pipeline between the diversion structure and the Folsom South Canal. FRWA's efforts are focused in the following five areas: (1) formal state and federal environmental review; (2) public information and outreach; (3) detailed engineering studies and project design; (4) permitting and land acquisition; and (5) construction. As shown on **Figure 8-1**, the implementation process is expected to take up to four to five years, with actual construction beginning in 2006 and a target operational date of 2009.

While planning, design, and construction activities move forward on surface water facilities, groundwater wells, treatment, transmission, and storage facilities will also need to be built in order to fully implement Zone 40's conjunctive use plan.

8.2 CEQA/NEPA COMPLIANCE

Because the WSMP is a long-term water supply program that will be implemented in phases over a number of years, a programmatic-level environmental review is appropriate with SCWA as the lead agency. For SCWA projects, such as future plant expansions, groundwater systems, and conveyance pipelines, environmental review will take place on a project by project basis at the time the need for that project has been identified. The results of these analyses will be presented to allow decision-makers, stakeholders, and other interested parties an opportunity to understand and comment on the environmental consequences of the proposed projects.



SCWA's completion and approval of this Plan sets the stage for various facility construction programs to move forward. These projects will require project level environmental review process and will look to the Plan for identification of potential impacts. Also, the Plan will support an appropriate funding program through Zone 40 development fees.

The Plan also provides the basis for submitting an application to SWRCB for water rights to divert excess Sacramento River water. SWRCB is therefore a CEQA Responsible Agency for this project and will rely on FRWA and the Plan EIR's in making its decision on SCWA's water rights application.

Projects identified in the capital program will require project level review from other state, regional, and/or local agencies that have regulatory authority over aspects of the project. **Table 8-1** summarizes the other agencies that have approval or permit authority over aspects of any proposed capital program.

8.3 NEXT STEPS

The next phase of work to be completed by SCWA is the development and approval of a finance program that allows for timely implementation of planned water facilities.

A detailed WSIP is currently being developed to identify the phasing and capacity requirements of future water supply facilities to meet build out water demands. The WSIP has and will continue to keep the WSMP and finance program current with planning activities taking place within Zone 40.

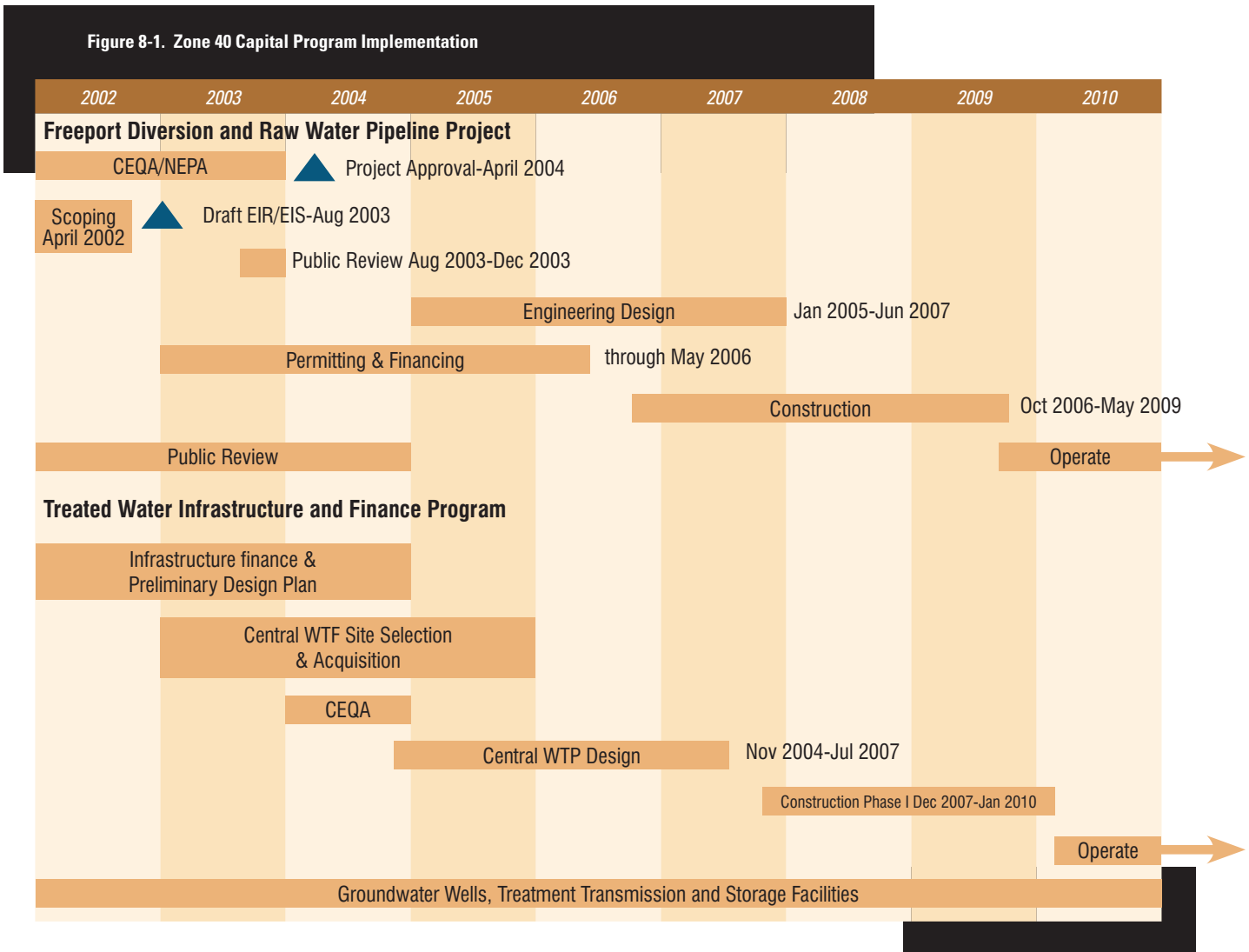


Table 8-1. Regulatory Agencies and Potential Permit Requirements

<i>Agency</i>	<i>Aspect of Zone 40 Program Requiring Permit</i>	<i>Permit</i>
US Army Corps of Engineers	Discharge of fill in wetlands or waters of the US: construction of the diversion structure in the Sacramento River and pipeline installation.	Clean Water Act 404 permit
	Construction in navigable waters: proposed new diversion structure in Sacramento River	Rivers and Harbors Act - Section 10 permit
US Fish and Wildlife Service	Impact to federally listed endangered species from project construction or operation.	Federal ESA compliance – no jeopardy BO
National Marine Fisheries Service	Impact to federally listed marine endangered species from project construction or operation: construction of the river diversion structure or operation of diversion intake.	Federal ESA compliance – no jeopardy BO
California Department of Fish and Game	Impact to state listed endangered species from project construction or operation.	State ESA – Section 2081 MOU
	Impact or alteration to any stream bed or bank: diversion structure and pipeline construction.	1601 Streambed Alteration Agreement
State Water Resources Control Board	Excess Sacramento River water diversion rights.	State water right
California Reclamation Board	Construction across state levees.	Encroachment permit
Regional Water Quality Control Board – Central Valley Region	Impact to state water quality standards due to impacts to wetlands.	Clean Water Act 401 Water Quality Certification
	Water quality impacts of construction.	NPDES Permit for Construction - Storm Water Pollution Prevention Plan (SWPPP)
Department of Health Services	Drinking water quality	Drinking Water Treatment Plant Permits
State Lands Commission	Construction on state-owned land – including beds of navigable waterways: diversion structure and pipeline construction.	
Sacramento County	Construction on County land (e.g., in roads).	Encroachment permit
City of Sacramento	Construction on City land (e.g., in streets).	Encroachment permit
California Air Resources Control Board	Stationary air emissions – new treatment plant	Permit to operate

8.4 PUBLIC INFORMATION AND OUTREACH

SCWA will conduct public information and outreach throughout implementation of the capital program. During the CEQA and/or NEPA process, this outreach will comply with environmental review process requirements and include: public scoping sessions; public workshops and hearings on the Draft EIR and/or environmental impact statement (EIS); and formal hearings on the Final EIR and/or EIS. A minimum 60-day review period will be provided for public review of the Draft EIR and/or EIS document. Following the review period, the lead agency will prepare and publish written responses to all comments received on the EIR and/or EIS to address public and agency comments.

8.5 ENGINEERING STUDIES / PROJECT DESIGN

Detailed engineering studies will be conducted during the environmental process of each project to sufficiently define project facilities, construction, operations, and project cost financing.

8.6 PERMITTING

Following the formal CEQA and/or NEPA environmental process, SCWA will obtain specific environmental and other permits for the construction and operation of the proposed facilities. The list of regulatory agencies potentially involved with the project and the permits required will be further developed during the environmental review process as agencies are asked to clarify their areas of authority over the proposed project. The environmental studies conducted during preparation of the EIR and/or EIS will be designed to also address the information requirements for these specific permits to the extent possible. The permitting process will be integrated into the environmental review process where appropriate.



Appendices



APPENDIX A

Sacramento County WFA PSA



APPENDIX A

**WATER FORUM SACRAMENTO COUNTY/SCWA'S
PURVEYOR SPECIFIC AGREEMENT**

COUNTY OF SACRAMENTO\SACRAMENTO COUNTY WATER AGENCY

A. INTRODUCTION

The County of Sacramento (County) purveys water in seven separate retail service areas within the unincorporated area. County retail service areas vary in size from as few as 30 connections in the smallest service area to more than 17,000 connections in the Laguna/Vineyard service area. There is a total of approximately 20,000 connections in the County retail service areas, of which about 19,000 are residential customers.

The Sacramento County Water Agency (SCWA) is responsible for providing wholesale water supply to an area of the Laguna, Vineyard, and Elk Grove communities commonly referred to as "Zone 40". The long-term Master Water Plan for Zone 40 is based on meeting present and future water needs through a program of conjunctive use of groundwater and surface water.

It is anticipated that Zone 40 will be expanded to include large areas in the southern part of Sacramento county which may be developed that are presently unorganized as far as water supply. Both supply and demands for these new growth areas are included in this County/SCWA Purveyor Specific Agreement.

Neither the County nor SCWA presently has long-term surface water entitlements. However, SCWA has entered into a contract with USBR for 22,000 AF of American River water, authorized by Public Law 101-514. Seven thousand AF of the 22,000 AF of water will be subcontracted to the City of Folsom. The remaining 15,000 AF of the PL 101-514 water for SCWA use will be diverted at or near the mouth of the American River or from the Sacramento River. SCWA has also entered into a three party agreement-in-principle with SMUD and the City of Sacramento for the assignment to SCWA of 15,000 AF of SMUD's existing contract with the USBR, to be diverted at or near the mouth of the American River or from the Sacramento River. SCWA and SMUD have also begun negotiations for purchase by the SCWA and assignment from SMUD of a second 15,000 AF block of SMUD's USBR contract. A portion of the payments to SMUD from the County would be used to construct groundwater facilities which may be operated and maintained by the County. Groundwater from these wells would be available as an alternative supply for SMUD to meet increased demands in the drier and conference years as defined in the Purveyor Specific Agreement for SMUD.

In addition to the 15,000 AF of PL 101-514 contract and pursuing 30,000 AF of SMUD surface water, SCWA has applied to the SWRCB for excess flows on the American and Sacramento Rivers. That application is pending and is subject to negotiated terms through the Water Forum for delivery. To reduce reliance on intermittent surface water, SCWA intends to pursue upstream water transfers which would be diverted at or near the mouth of the American River or from the Sacramento River.

Delivery of surface water to Zone 40 requires wholesale and wheeling contracts between the City of Sacramento and SCWA. This includes construction of facilities, including treatment plant capacity within the City of Sacramento.

A portion of the expanded Zone 40 area is situated within the Place of Use for the City of Sacramento's American River water entitlements. It is assumed that these entitlements would be used to serve this expanded Zone 40 area. Conditions for use of this entitlement would be

consistent with the conditions outlined in the City of Sacramento's Purveyor Specific Agreement.

All of the County's retail service areas are supplied groundwater with the exception of the Laguna/Vineyard service area (Zone 40), which is supplied groundwater in combination with interim surface water. County/SCWA has an agreement with the City of Sacramento for treatment and delivery of interim surface water to Zone 40.

A portion of the Elk Grove Water Works (EGWW) retail service area is located within the boundary of Zone 40. Water used in this area is made up of groundwater pumped by EGWW and groundwater and surface water served to EGWW through a wholesale water purchase agreement with SCWA. The contract between the SCWA and the USBR for water available through PL 101-514 requires that EGWW meet the terms and conditions of the PL 101-514 contract including a comprehensive water conservation plan and meter retrofit program to receive CVP contract surface water.

B. SEVEN ELEMENTS OF THE *WATER FORUM AGREEMENT*: INTEGRATED PACKAGE

In order to achieve the Water Forum's two coequal objectives, providing a safe reliable water supply and preserving the values of the Lower American River, all signatories to the *Water Forum Agreement* need to endorse and, where appropriate, participate in each of seven complementary actions.

- Increased Surface Water Diversions

- Actions to Meet Customers' Needs While Reducing Diversion Impacts in Drier Years

- Support for an Improved Pattern of Fishery Flow Releases from Folsom Reservoir

- Lower American River Habitat Management Element

- Water Conservation Element

- Groundwater Management Element

- Water Forum Successor Effort

For each interest to get its needs met, it has to endorse all seven elements. Based on this linkage, signatories agree to endorse and, where appropriate, participate in all seven of these elements.

C. BASELINE DIVERSIONS

Baseline diversions represent the historic maximum amount of water diverted annually from the American River through the year 1995.

No American River diversions were included in the baseline for County/SCWA.

D. AGREEMENT FOR MEETING THE COUNTY OF SACRAMENTO'S AND THE SACRAMENTO COUNTY WATER AGENCY'S WATER SUPPLY NEEDS TO THE YEAR 2030

The County/SCWA surface water needs are included in the South County M&I users group. The County/SCWA portion of the demand, 87,000 AF, includes both existing and expanded Zone 40

areas. It is anticipated that Zone 40 will be expanded to include large areas in the southern part of Sacramento County which may be developed that are presently unorganized.

To meet these demands, the firm surface water supply of 45,000 AF (15,000 AF of USBR contract water under PL 101-514 and 30,000 AF of SMUD entitlement transfer), an intermittent surface water supply of 33,000 AF, and groundwater will be necessary. The PL 101-514 and SMUD water will be subject to shortages imposed on all CVP M&I contractors. Intermittent surface water is available only when the water is surplus to the needs of the San Joaquin-Sacramento River and Delta. Upstream water transfers will be pursued to reduce reliance on intermittent surface water. All of the surface water for the County/SCWA is assumed to be diverted at or near the mouth of the American River or from the Sacramento River.

Groundwater will be used in a conjunctive use basis by the South County M&I users group with a total 2030 demand of 117,600 AF. The South County M&I users group also includes a portion of Citizens Utilities Company and the Elk Grove Water Works. The amount of groundwater used will vary from approximately 95,100 AF in the driest years decreasing to approximately 34,000 AF in the wet years.

E. SPECIFIC AGREEMENTS FOR COMPLYING WITH THE SEVEN ELEMENTS

(Agreements in italics are common in all Specific Agreements.)

1. All signatories to the *Water Forum Agreement* will endorse water entitlements needed in this Purveyor Specific Agreement as follows:
 - a. All signatories to the *Water Forum Agreement* agree to continue their support for SCWA's contract for 22,000 acre feet of water authorized by Public Law 101-514.
 - b. All signatories to the *Water Forum Agreement* will support transfers of 30,000 acre feet of Sacramento Municipal Utility District's Central Valley Project entitlement to be used for planned growth within the Urban Service Boundary.
 - c. All signatories agree to support a conjunctive use program to meet SCWA's water needs for planned growth within the Urban Service boundary.
 - d. All signatories to the *Water Forum Agreement* agree to support additional transfers of existing entitlements or new entitlements needed to support such a conjunctive use program. However environmental signatory organizations' support for specific additional transfers or new entitlements is subject to: their review of the specifics of the additional transfers or entitlements; their concurrence on the adequacy of conditions that will be included as part of such additional transfers or new entitlements; and full compliance with all applicable environmental laws and requirements.
 - e. All signatories anticipate that SCWA's water conservation program, contributions to the Successor Effort and contributions to the Lower American River Habitat Management Element would not have to be renegotiated in the context of additional transfers or new entitlements diverted from the Sacramento River.
2. *All signatories will endorse construction of facilities to divert, treat and distribute water consistent with this Purveyor Specific Agreement and the Water Forum Agreement*

including diversion structures, treatment plants, pumping stations, wells, storage facilities, and major transmission piping. Endorsement is also to be provided for necessary rights-of-ways, permits, and other endorsements which may be needed, in the context of the following five points:

- a. All signatories agree that implementation of the Water Forum Agreement including an Improved Pattern of Fishery Flow Releases, the Updated Lower American River flow standard, the Lower American River Habitat Management Element, Actions to Meet Customers' Needs While Reducing Diversion Impacts in Drier Years, and the Water Conservation Element constitute reasonable and feasible mitigation for any cumulative impacts on the Lower American River caused by diversions included in the Water Forum Agreement.
 - b. *Environmental impacts of facilities to divert, treat and distribute water will be subject to site-specific environmental review. It is understood that signatories may provide comments on site specific impacts. All signatories will work in good faith to agree on reasonable and feasible mitigation for any site-specific impacts.*
 - c. *To the extent that the water facilities are consistent with the Water Forum Agreement, signatories agree that they will not object to those water facilities based on the cumulative impacts to the Lower American River. Nor will signatories object to water facilities consistent with the Water Forum Agreement based on the planned growth to be served by those water facilities. (See Section Four IV, Relationship of Water Forum Agreement to Land Use Decision Making.)*
 - d. *d. In the planning for new water diversion, treatment, and distribution facilities identified in the Water Forum Agreement, water purveyors signatory to the Agreement will either provide for a public participation process, such as meeting with already established citizen advisory committees, or other appropriate means to help design and implement these projects.*
 - e. *e. All signatories retain their existing ability to provide input on specific details of facility design, financing, and construction.*
3. *Endorsement of the water entitlements and related facilities in the Water Forum Agreement means that signatories will expend reasonable efforts to:*
- a. Speak before stakeholder boards and regulatory bodies,
 - b. Provide letters of endorsement,
 - c. Provide supportive comments to the media,
 - d. Advocate the Water Forum Agreement to other organizations, including environmental organizations that are not signatory to the Water Forum Agreement, and
 - e. Otherwise respond to requests from other signatories to make public their endorsement of the seven elements of the Water Forum Agreement.
4. *All signatories agree that participation in the Water Forum, and any successor effort is in the best interests of water consumers and the region as a whole. Participation in the Water Forum is the most economically feasible method of ensuring that water demands*

of the future will be met. Furthermore, provisions for groundwater management, conjunctive use, conservation programs, improved pattern of fishery flow releases from Folsom Reservoir, habitat management, and a reliable dry year supply are in the public interest, and represent reasonable and beneficial use of the water resource.

5. *All signatories will not oppose and will endorse where appropriate needed rates and fees applied equitably. This includes endorsement at the California Public Utilities Commission for investor owned utilities' ability to recover all costs of conservation programs, including residential meter retrofit, through rates.*
6. *All signatories will endorse an Improved Pattern of Fishery Flow Releases from Folsom Reservoir and reduced daily flow fluctuations for the Lower American River. (Reference Section Three, III.)*
7. *All signatories will endorse formal assurances that the diversions will be consistent with the conditions in the Water Forum Agreement and that an Improved Pattern of Fishery Flow Releases from Folsom Reservoir will be implemented.*

All signatories will endorse and participate where appropriate in all provisions of the Water Forum Agreement, including all agreements pertaining to other signatories and executed as part of this Agreement.

8. *All signatories will participate in education efforts and advocate the Water Forum Agreement to regulatory bodies and signatory stakeholder boards as appropriate.*
9. *All signatories will participate in the Water Forum Successor Effort to oversee, monitor and report on the implementation of the Water Forum Agreement. (Reference Section Three, VII., Water Forum Successor Effort). This includes participating with other signatories in carrying out procedural agreements as identified in the Water Forum Agreement. To the extent that conditions change in the future, all signatories will work together in good faith to identify ways to ensure that the two coequal goals of the Water Forum will still be met.*
10. *All signatories will endorse and, where appropriate, financially participate in the Lower American River Habitat Management Element (Reference Section Three, IV., Lower American River Habitat Management Element).*
11. *All signatories will endorse and, where appropriate, implement the Water Conservation Element of the Agreement (Reference Section Three, V., Water Conservation Element). This purveyor's implementation of water conservation will be as specified in its Water Conservation Plan which is incorporated as Appendix J to the Water Forum Agreement.*
12. *All signatories will endorse and, where appropriate, participate in implementation of the Sacramento North Area Groundwater Management Authority to maintain a North Area estimated average annual sustainable yield of 131,000 acre feet.*
13. *All signatories will endorse development of a groundwater management arrangement for the South Area and where appropriate participate in its development, to maintain a South Area estimated average annual sustainable yield of 273,000 acre feet.*
14. *All signatories will endorse development of a groundwater management arrangement for the Galt Area and where appropriate participate in its development, to maintain a Galt Area estimated average annual sustainable yield of 115,000 acre feet.*

15. *Signatories authorizing individuals to represent them in matters included within the Water Forum Agreement will ensure that representations made by those individuals are consistent with the Water Forum Agreement and are upheld by the signatories.*
16. *This Agreement is in force and effect for all signatories for the term of the Memorandum of Understanding, December 31, 2030.*
17. *Any solution that provides for future needs will have costs. New diversion, treatment, and distribution facilities, wells, conservation programs, and required environmental mitigation will be needed. This Agreement identifies that these solutions must be equitable, fiscally responsible, and make the most efficient use of the public's money.*

Water suppliers have both capital costs for facilities and operations and maintenance costs. This Agreement recommends that charges imposed to recover capital costs associated with water acquisition, treatment, or delivery be equitable. Any costs for facilities funded through bonds will be recovered as provided by law. In addition, signatories to the Water Forum agree that operational, maintenance and replacement costs should be recovered from beneficiaries of the system in accordance with California Government Code Sections 53720 to 53730 (Proposition 62) and California Constitution, Articles XIII, C and XIII, D (Proposition 218) and other laws to the extent they are applicable.

18. *All signatories to the Agreement will endorse County/SCWA for completion of PL 101-514 water contracts.*
19. *All signatories to the Agreement will endorse County/SCWA for completion of the assignments of portions of SMUD's Central Valley Project water contract.*
20. *All signatories to the Agreement will endorse construction of County/SCWA's water supply facilities (this may include joint facilities constructed by the City of Sacramento) which include diversion at or near the mouth of the American River or from the Sacramento River, treatment plants, pumping stations, wells, storage facilities, and transmission piping. Endorsement is also needed for right of ways, permits, environmental documentation, and other endorsement which may be identified for County/SCWA to meet needs to the year 2030.*
21. *All signatories to the Agreement will endorse County/SCWA agreements with the City of Sacramento for wheeling and wholesaling of surface water prior to and after completion of the City's capacity expansion.*
22. *All signatories agree to endorse, and where appropriate, participate in Sacramento River Supply for North Sacramento County and Placer County (Reference Section Four, III).*
23. *All signatories will endorse, and where appropriate, participate in the section of the Water Forum Agreement entitled "Relationship of Water Forum Agreement to Land Use Decision Making" (Reference Four, IV).*
24. *All signatories will endorse, and where appropriate, participate in the Folsom Reservoir Recreation Program (Reference Section Four, V).*
25. *Purveyors signatory to the Water Forum Agreement will reference the Water Forum Agreement, including agreed upon estimated average annual sustainable yields of each of the three subareas of the groundwater basin in Sacramento County and limits to diversions from the American River in their water master plans and urban water*

management plans, which are used in providing information to cities and counties as required under Chapter 881 of the Statutes of 1995.

26. *Any transfers of American River water by signatories will be delivered in a manner consistent with an Improved Pattern of Fishery Flow Releases as referenced in the Water Forum Agreement.*

F. ASSURANCES AND CAVEATS

Because the *Water Forum Agreement* is a comprehensive set of linked elements, it is absolutely essential that adequate assurances be secured for every element. In an agreement that will extend over three decades, the timing of these assurances is critical. Full implementation of all seven elements cannot occur simultaneously. Therefore all signatories agree with the provisions in the Assurances and Caveats Section of this *Water Forum Agreement*.

Two particularly important assurances are the updated Lower American River Flow Standard and Upstream American River Diversion Agreements. All signatories agree they will recommend to the State Water Resources Control Board an updated American River flow standard and updated Declaration of Full Appropriation to protect the fishery, wildlife, recreational and aesthetic values of the Lower American River. The recommendation will include requirements for U.S. Bureau of Reclamation releases to the Lower American River. In addition, the City of Sacramento's Fairbairn diversion will be required to comply with the diversion limitations of the City's Purveyor Specific Agreement. The *Water Forum Agreement* also includes agreed upon dry year reductions by purveyors upstream of Nimbus Dam. The recommendation for an updated Lower American River standard will be consistent with:

Water Forum Agreement provisions on water diversions including dry year diversions,

and

Implementation of the Improved Pattern of Fishery Flow Releases which optimizes the release of water for the fisheries.

The recommendation will also address related issues such as principles to guide water management in the driest years, flexibility in the standard to allow adaptive management, and amending the existing "Declaration of Full Appropriation for the American River."

Purveyors signatory to the *Water Forum Agreement* who divert from upstream of Nimbus Dam agree they will enter into contract with the Bureau that will provide assurances that the upstream diverters will divert only the agreed upon amounts, which include provisions for reductions in dry year and/or other equivalent measures.

In order to have a durable agreement it is necessary to include the following caveats. These are statements describing actions or conditions that must exist for the *Agreement* to be operative.

1. As specified below, each purveyor's commitment to implementing all provisions of the *Water Forum Agreement* is contingent on it successfully obtaining its water supply entitlements and facilities.
 - a. If a purveyor receives support from the other signatories to the Agreement for all of its facilities and entitlements as shown on the chart in Section Three, I., of the Water Forum Agreement, "Major Water Supply Projects that Will Receive Support Upon Signing the Water Forum Agreement" and if it receives all

necessary approvals for some or all of those facilities and entitlements, then the purveyor will fully support and participate in the following provisions of the Water Forum Agreement:

- (1) Support for the Improved Pattern of Fishery Flow Releases
- (2) Water Forum Successor Effort
- (3) Water Conservation Element
- (4) Lower American River Habitat Management Element
- (5) Support for the Updated Lower American River flow standard
- (6) Restriction of diversions or implementation of other actions to reduce diversion impacts in drier years as specified in its Purveyor Specific Agreement.

and

- b. If a purveyor is not successful in obtaining all necessary approvals for all of its facilities and entitlements as shown on the chart in Section Three, I., of the Water Forum Agreement, “Major Water Supply Projects that will Receive Support Upon Signing the Water Forum Agreement,” that would constitute a changed condition that would be considered by the Water Forum Successor Effort.
2. All signatories agree that business, citizens, and environmental signatories’ obligation to support, and where specified, implement all provisions of the Water Forum Agreement is contingent on implementation of those provisions of the Agreement that meet their interests.
 3. A stakeholder’s support for water supply entitlements and facilities is contingent on:
 - a. Project-specific compliance with the California Environmental Quality Act, and where applicable, the National Environmental Policy Act, federal Endangered Species Act and California Endangered Species Act.
 - b. Purveyors’ commitment in their project-specific EIRs and CEQA findings to: all seven elements of the Water Forum Agreement; support for updating the Lower American River flow standard; commitment by those purveyors that divert from upstream of Nimbus Dam to entering into signed diversion agreements with the U.S. Bureau of Reclamation; commitment by the City of Sacramento to inclusion of the terms of the diversion provisions of its Purveyor Specific Agreement into its water rights.
 - c. Signed diversion agreements between purveyors that divert upstream of Nimbus Dam and the U.S. Bureau of Reclamation. Other signatories to the Water Forum Agreement shall be third party beneficiaries to the diversion agreements solely for the purpose of seeking specific performance of the diversion agreements relating to reductions in surface water deliveries and/or diversions if Reclamation fails to enforce any of those provisions. The status of a signatory to the Water Forum Agreement as a third party beneficiary to the diversion agreements is dependent on that signatory complying with all the terms of the Water Forum Agreement, including support for the purveyor specific agreement for the purveyor’s project.

This is not to intend to create any other third party beneficiaries to the diversion agreements, and expressly denies the creation of any third party beneficiary rights hereunder for any other person or entity.

- d. Adequate progress on the updated Lower American River standard. The schedule for obtaining the updated standard is in Section Four, I., of the *Water Forum Agreement*.
 - e. Adequate progress in construction of the Temperature Control Device.
 - f. Adequate progress in addressing the Sacramento River and Bay-Delta conditions associated with implementation of the Water Forum Agreement.
4. Environmental stakeholders' support for facilities and entitlements is dependent upon the future environmental conditions in the Lower American River being substantially equivalent to or better than the conditions projected in the Water Forum EIR. If the future environmental conditions in Lower American River environment are significantly worse than the conditions projected in the EIR, this would constitute a changed condition that would be considered by the Water Forum Successor Effort. Significant new information on the needs of the Lower American River fisheries, which was not known at the time of execution of the Water Forum Agreement, would also constitute a changed condition that would be considered by the Water Forum Successor Effort.

G. REMAINING ISSUES

Development of a groundwater management arrangement for the South Area.

APPENDIX B
FIRST AMENDED AND RESTATED MASTER WATER
AGREEMENT WITH FLORIN RESOURCE
CONSERVATION DISTRICT/ELK GROVE WATER
SERVICE

**FIRST AMENDED AND RESTATED MASTER WATER AGREEMENT
BETWEEN SACRAMENTO COUNTY WATER AGENCY AND
FLORIN RESOURCE CONSERVATION DISTRICT/ELK GROVE WATER SERVICE,
SUCCESSORS-IN-INTEREST TO ELK GROVE WATER WORKS**

THIS FIRST AMENDED AND RESTATED MASTER WATER AGREEMENT is made and entered into this 28th day of June, 2002, by and between the Sacramento County Water Agency ("SCWA"), a political subdivision of the State of California and Florin Resource Conservation District, an independent special district, d.b.a., Elk Grove Water Service ("FRCD"), successors-in-interest to Elk Grove Water Works ("EGWW").

RECITALS

WHEREAS, the SCWA and the Elk Grove Water Works have previously entered into an agreement entitled "County of Sacramento Elk Grove Water Works Master Water Agreement" dated February 28, 1995 to establish the terms and conditions under which the SCWA would provide for a permanent supply of wholesale treated groundwater and/or surface water to the Elk Grove Water Works for use within EGWW's Expanded Franchise Area (hereinafter "Master Water Agreement"); and

WHEREAS, a major purpose of entering the Master Water Agreement was that SCWA and EGWW had as a common goal the stabilization of the groundwater table by managing the conjunctive use of surface water and groundwater in their respective areas; and

WHEREAS, the Master Water Agreement has three key elements: (1) the EGWW was to provide retail water service to the Expanded Franchise Area and in that capacity owns, operates and maintains all retail water distribution facilities; (2) the SCWA was to provide the wholesale water within the Expanded Franchise Area, and in that capacity owns, operates and maintains all wholesale water production, treatment and transmission facilities; and (3) the SCWA continues to collect Zone 40 fees from those portions of Zone 40 lying within the boundaries of the Expanded Franchise Area; and

WHEREAS, each of the parties to this Agreement is a local water purveyor functioning within Sacramento County; and

WHEREAS, SCWA has available potable groundwater production capacity and/or surface water to meet the needs of the Expanded Franchise Area as hereinafter defined; and

WHEREAS, FRCD is desirous of purchasing a permanent supply of potable ground and/or surface water from SCWA; and

WHEREAS, on December 8, 1999 FRCD acquired the assets of EGWW; and

WHEREAS, on August 20, 2001 SCWA filed a Complaint for Declaratory and Injunctive Relief against FRCD (*Sacramento County Water Agency, et al. v. Florin Resources Conservation District, et al.* Sacramento Superior Court Case No. 01AS05044, transferred to San Joaquin Superior Court and re-numbered San Joaquin Superior Court Case No. 01CV16036) seeking, among other things, a determination that FRCD was bound as a successor-in-interest to EGWW by the terms and conditions of the Master Water Agreement; and

WHEREAS, FRCD has acknowledged that it is a successor-in-interest to EGWW under the Master Water Agreement; and

WHEREAS, SCWA and FRCD desire to formally amend the Master Water Agreement to formally name FRCD as a successor-in-interest to EGWW and to address certain procedural issues associated with the Master Water Agreement.

NOW, THEREFORE, the Agreement is amended as follows:

I. PURPOSE

The parties are entering into this Agreement in order to establish the terms under which a permanent supply of wholesale treated groundwater and/or surface water will be provided by SCWA to FRCD, as successor-in-interest to EGWW, for use within its expanded franchise area.

II. DEFINITIONS

- a. FRCD Water Facilities. All facilities, including distribution mains, services, meters, hydrants and all associated appurtenances, which are owned and operated by FRCD to supply water to its customers.
- b. SCWA Water Facilities. All facilities, including wells, transmission mains, storage facilities and all associated appurtenances, which are owned and operated by SCWA to supply water to its customers.
- c. Points of Connection. A point or points of connection for delivery of treated water from SCWA's Water Facilities to the FRCD Water Facilities, including land, meters, and associated appurtenances.
- d. Zone 40. A zone of the Sacramento County Water Agency established by the Agency Board of Directors on May 14, 1985, the boundaries of which are shown on attached Exhibit "A", and as it may change from time to time.
- e. Zone 41. A zone of the Sacramento County Water Agency established by the Agency Board of Directors on June 13, 2000, the boundaries of which are shown on attached Exhibit "C", and as it may change from time to time.

f. Expanded Franchise Area. The area which the Sacramento County Board of Supervisors on June 30, 1987 granted to Elk Grove Water Works, Inc., FRCD's predecessor in interest, a non-exclusive franchise for the construction, operation and maintenance of Elk Grove Water Works facilities as said area is shown on attached Exhibit "B".

g. Potable Water. Ground or surface water that meets the State Department of Health Services Drinking Water Standards.

h. Ordinance No. 18. An Ordinance of the Sacramento County Water Agency establishing fees, charges, credits and regulations for the wholesale supply of water to zones within the Agency, adopted by the Board of Directors on August 26, 1986.

i. Title 3. A section of the Sacramento County Water Agency Code establishing fees, charges, and regulations for the sale of water within said Zone, adopted by the Agency Board of Directors on June 20, 2000

III. WATER DELIVERY

a. SCWA shall deliver all potable water necessary for FRCD's retail customers in the Expanded Franchise Area, including water for fire protection consistent with SCWA design and operations standards in effect at the time a facility is constructed.

b. SCWA shall plan, construct, operate and maintain water facilities so as to provide FRCD with the quantity of potable water required to be delivered by this Agreement. SCWA may substitute treated surface water for the groundwater provided to FRCD.

c. SCWA shall be responsible for compliance with all applicable laws and regulations related to extraction, diversion, treatment and delivery of potable water to FRCD pursuant to this Agreement, such as the California Environmental Quality Act, the Federal and State Endangered Species Acts, Clean Water Act, the Porter-Cologne Water Quality Act and any other requirements of any federal, state or local agency.

d. FRCD shall pay SCWA for any and all costs associated with diverting, pumping, processing and delivering such water to FRCD pursuant to this Agreement. The amount to be paid by FRCD pursuant to this subparagraph shall be calculated in the manner described in paragraph 5 of this Agreement.

e. FRCD shall be responsible for compliance with all applicable laws and regulations related to delivery of potable water for use within the Expanded Franchise Area, such as the California Environmental Quality Act, the Federal

and State Endangered Species Acts, Clean Water Act, the Porter-Cologne Water Quality Act and any other requirements of any federal, state or local agency.

f. FRCD shall accept treated surface water, in lieu of groundwater, at the option of SCWA.

IV. POINTS OF CONNECTION AND DELIVERY STRUCTURES

a. Potable water shall be provided from SCWA facilities through Points of Connection to be located as determined by SCWA in coordination with FRCD.

b. All Points of Connection shall be designed and constructed or caused to be designed and constructed by and at the expense of SCWA, including land, meters, and associated appurtenances as described in subsequent paragraphs of this Agreement, and shall be the property of SCWA.

c. SCWA shall be responsible for the maintenance and operation of all Points of Connection.

d. With the exception of SCWA funded transmission mains, or other facilities as may be mutually agreed upon, FRCD shall design, construct, own, operate and maintain all facilities downstream of the Points of Connection.

e. SCWA shall calibrate Points of Connection metering devices at its discretion. Service charges shall be adjusted upward or downward, as appropriate, for metering errors in excess of two percent (2%), covering the known or estimated period of duration of such error, but in no event exceeding six months.

V. COST ALLOCATION AND PAYMENT

a. Operations and Maintenance Component. FRCD will pay for all costs incurred by SCWA for the procurement, extraction, diversion, treatment and conveyance of potable water on a cost-per-unit quantity basis for potable water actually delivered to FRCD. The cost will be determined by SCWA in an equitable manner such that FRCD neither subsidizes, nor is subsidized by another SCWA customer. In no event, however, shall the unit cost of water exceed SCWA's annual operating and maintenance costs for groundwater and/or surface water extraction, diversion, treatment and conveyance divided by the number of gallons produced allowing for a water loss factor mutually agreeable to both parties. Operating and maintenance costs shall include but not be limited to operating and maintenance personnel, services, supplies, capital replacement and improvement projects not funded by Zone 40 development fees, and an equitable proration of appropriate overhead. Operating and maintenance costs shall exclude those costs that are not related to the production and delivery of wholesale water to FRCD.

b. Capital Component. In addition to the operation and maintenance charge described in subparagraph (a) above, FRCD shall pay to SCWA user charges pursuant to Section 3.50.140, Special Capital Development Fee, Title 3 of SCWA Code. Said costs will be determined bi-monthly on the basis of the number and type of users being served SCWA wholesale water by FRCD in the Expanded Franchise Area and will be added to the charges determined per subparagraph (a), above.

c. Nothing in this Agreement shall preclude SCWA from adjusting unit costs for wholesale water to reflect actual cost increases in operation and maintenance.

d. On or before April 1 of each year SCWA shall provide FRCD an (1) an estimate of the unit cost of wholesale water for the ensuing twelve-month period beginning July 1; (2) a five-year projection of estimated wholesale water costs and (3) notice of SCWA's intent to deliver treated surface water to FRCD, if applicable. SCWA will make a reasonable effort to keep wholesale water costs equal to or less than those contained in the five-year estimate. At the end of every bi-monthly period, the quantities of water delivered during the previous two months will be determined by FRCD from its retail customer water meters or by an equivalent method acceptable to both parties until water meters are in place, and service charges for that bi-monthly period will be based on the quantity of water delivered times the unit rate. Until the parties agree upon a more efficient method for determining the amount of wholesale water delivered by SCWA to FRCD, FRCD shall be responsible for submitting to SCWA within ten (10) days of the end of each period the quantity of water delivered during that bi-monthly period. A bill shall be submitted to FRCD within 30 days of the end of each bi-monthly period and payment shall be made by FRCD within 30 days following receipt of the bill.

VI. TERM OF THE AGREEMENT

This Agreement shall become effective as of the date of execution by all parties. The term of this Agreement is fifty (50) years. This agreement shall be automatically extended for one additional fifty year term at the end of fifty (50) years, unless the party desiring not to extend the Agreement provides five (5) years advanced written notice of that party's intent not to extend the agreement. This Agreement may be terminated prior to the expiration of its term for cause or by mutual agreement of the parties.

VII. FAILURE TO DELIVER WATER

SCWA shall not be liable for failure to deliver potable water to FRCD hereunder in the amounts hereinabove, provided that such failure is caused by reasons beyond the reasonable control of SCWA.

VIII. RIGHTS TO CONSTRUCT FACILITIES

As between the parties to this Agreement, SCWA shall have the sole right to construct, operate and maintain public water production, treatment, storage and transmission facilities within the Expanded Franchise Area. SCWA may grant FRCD permission by separate written agreement to construct, operate and maintain such facilities in the Expanded Franchise Area for the sole purpose of providing water to the original certificated service area granted to EGWW by the California Public Utilities Commission (hereinafter "PUC Certificated Area"), as shown on Exhibit C. In the event SCWA is unable to provide potable water pursuant to this Agreement, FRCD shall have the right to construct, operate and maintain any new facilities necessary to provide the amount of water supply needed to correct deficiencies of the SCWA wholesale supply capacity in the Expanded Franchise Area; provided, however, that FRCD shall provide written notice to SCWA identifying such deficiencies and SCWA shall be provided fifteen (15) days to correct said deficiencies.

IX. RIGHT TO PROVIDE RETAIL WATER SERVICE

As between the parties to this Agreement, FRCD shall have the sole right to provide retail water service within the Expanded Franchise Area, which includes all activities necessary to deliver potable water from the Points of Connection to the end user. In the event FRCD is unable to provide such retail service, SCWA shall have the right to provide the same.

X. CAMDENS & SUPERBLOCK AREAS

The areas identified on the attached Exhibit "C" identified as "Camdens" and "Superblock" are excluded from the terms and conditions of this Agreement, however, the parties agree to negotiate in good faith to attempt to include said areas within the Agreement. In the interim, SCWA agrees to provide peaking water to the Camdens at the Sheldon Road Point of Connection, as such water is available.

XI. WATER MANAGEMENT/CONSERVATION

FRCD agrees to support and promote "Best Management Practices" for water conservation as required by contracts between SCWA and the United States Bureau of Reclamation, and to implement water management and conservation practices as may be imposed on SCWA or the County by other agencies. SCWA shall have the right to meet the non-potable demands in the Expanded Franchise Area with reclaimed water, pursuant to the policies and practices that are applicable to the SCWA service area for provision of reclaimed water.

XII. GROUNDWATER MANAGEMENT

SCWA and FRCD shall support and cooperate with each other regarding groundwater management.

XIII. FEES

FRCD agrees that SCWA may collect any and all assessments, fees and charges levied pursuant to sections 4.4 or 10.5 of the Sacramento County Water Agency Act within the Expanded Franchise Area for the provision of water in the Expanded Franchise Area.

XIV. NOTICE

Unless indicated otherwise herein, all notices, invoices, payments, statements or other writing authorized or required by this Agreement shall be deposited in the United States mail, postage prepaid and addressed to the respective parties as follows:

SCWA:
Chief of Water Resources
Sacramento County Dept.
Of Water Resources
827 7th Street, Room 301
Sacramento, CA 95814

FRCD:
General Manager
Florin Resources Conservation
District, dba Elk Grove Water Service
9257 Elk Grove Boulevard
Elk Grove, CA 95624

All notices, invoices, payments or other writings shall be deemed served on the day that they are deposited, postage prepaid, in the United States mail. Nothing in this paragraph shall preclude the service of any notice, invoices, payments, statements or other writings by personal delivery to the parties indicated above.

XV. INDEMNIFICATION & DEFENSE

- a. By FRCD: FRCD shall fully indemnify and hold harmless SCWA from any claims, actions or liability for any damages, any injury to persons or property, or any violation of any law or regulation, occurring by reason of anything done or failed to be done by FRCD, its officers or employees, under this Agreement.
- b. By SCWA: SCWA shall fully indemnify and hold harmless FRCD from any claims, actions or liability for any damages, any injury to persons or property, or any violation of any law or regulation, occurring by reason of anything done or failed to be done by SCWA, its officers or employees, under this Agreement.

XVI. RECORDS INSPECTION

Each party shall be entitled to inspect and photocopy the records of any other party which pertain to this Agreement, upon providing reasonable notice to such other party of its intent to do so. Each party may also appoint an auditor or auditors to examine the financial records of any other party to determine the adequacy of cost and billing information maintained by each party. After reasonable notice, each party shall make available to the other party's auditor or auditors all requested records and shall assist and cooperate with such auditors. Each party shall keep its accounting and financial records in accordance with generally accepted accounting principals.

XVII. AMENDMENTS

No amendment or modification to this Agreement shall be valid unless executed in writing and approved by the governing bodies or authorized individuals of each party; provided, however, the annual schedule may be modified by mutual written agreement of SCWA and FRCD staff without obtaining approvals from the governing bodies of the parties hereto.

XVIII. NO THIRD PARTY BENEFICIARY

This Agreement is not intended to, and shall not be interpreted as conferring any benefits or rights whatsoever upon any person or entity which is not a party hereto.

XIX. ASSIGNMENT

This Agreement shall inure to the benefit and bind the successors and assigns of the parties including any successor water company or public agency which is obligated to serve water in the Expanded Franchise Area. FRCD is hereby specifically named as a successor-in-interest to the EGWW in the Master Water Agreement.

XX. RIGHT TO MATCH OFFER

FRCD shall provide SCWA with notice of any bona-fide offer to purchase or acquire the assets of FRCD within thirty (30) days of the date of said offer. SCWA shall have thirty (30) days beyond the date of said notice to match any offer to purchase the assets of FRCD.

XXI. EXHIBITS INCORPORATED

All Exhibits referred to herein are fully incorporated into this Agreement as if such Exhibits were set forth in their entirety at this place.

XXII. REAFFIRMATION

In all other respects, the above original Master Water Agreement, as amended, remains in full force and effect.

XXIII. ENTIRE AGREEMENT

This Agreement, as amended, and any attachments hereto, constitute the entire understanding between the COUNTY and FRCD concerning the subject matter contained herein.

XXIV. EFFECTIVE DATE

This First Amended and Restated Master Water Agreement shall be deemed effective as of the date and date first written above.

(SIGNATURE PAGE FOLLOWS)

Exhibit A



Zone 40 Boundary Sacramento County Water Agency (SCWA)

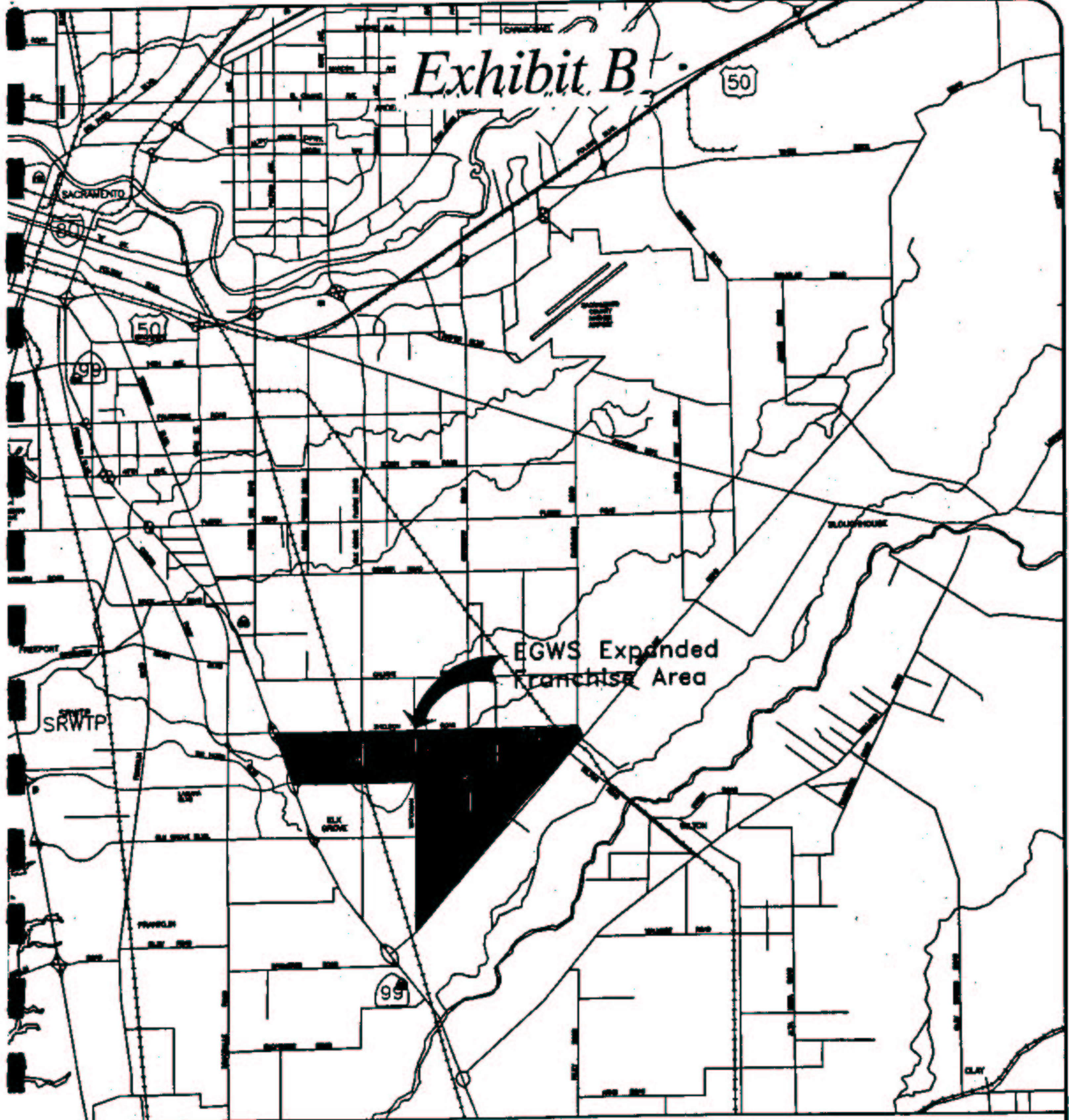
— SCWA Zone 40 Boundary

0 1/2 1
SCALE IN MILES



Date: May 20, 2002
By: SCWA (R. Steeg)
Scale: 1" = 2.5 Miles

Exhibit B



Elk Grove Water Service Expanded Franchise Area Sacramento County Water Agency (SCWA)

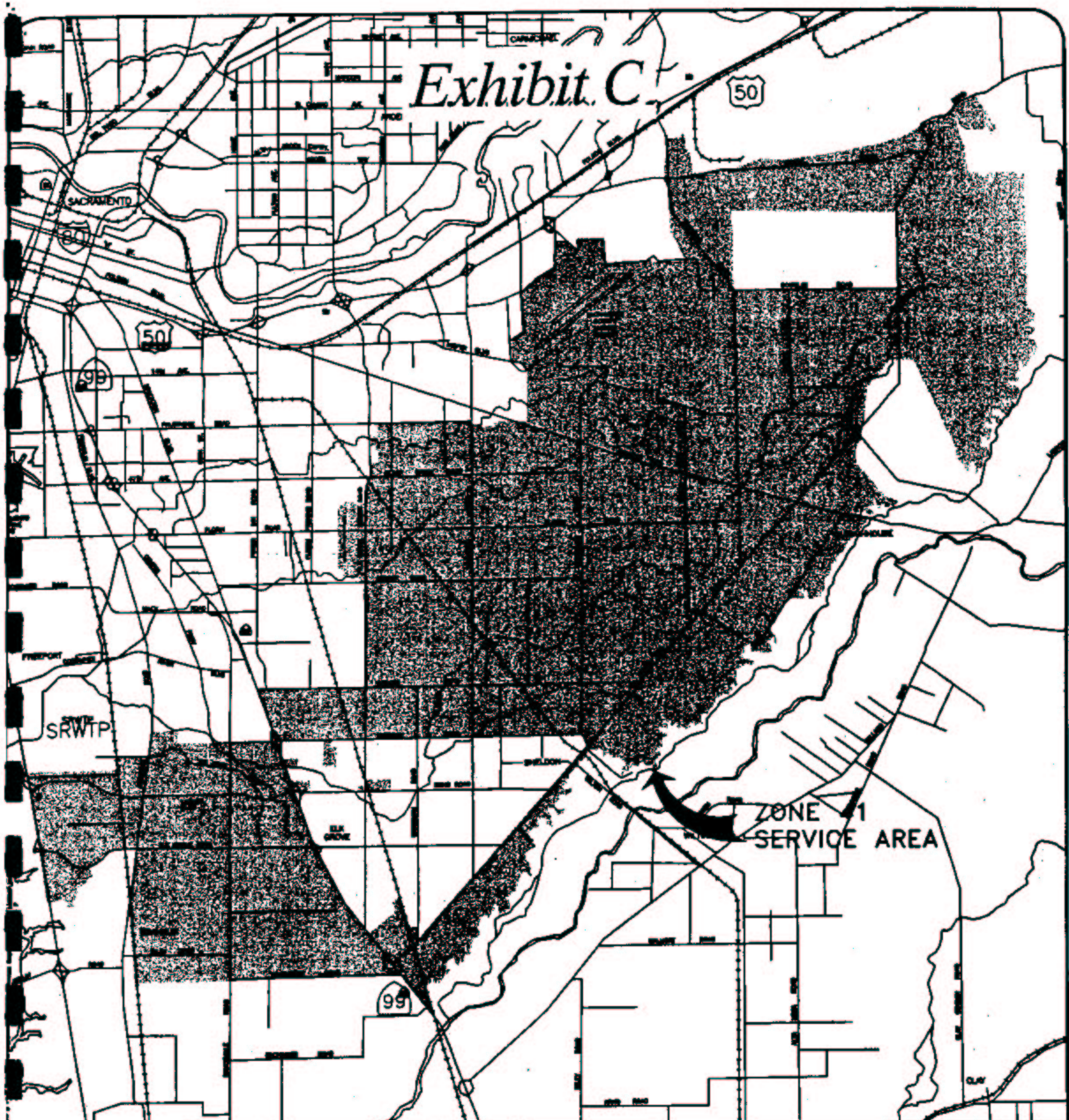
 EGWS Expanded Franchise Area


SCALE IN MILES



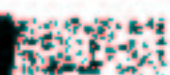
Date: May 20, 2002
By: SCWA (R. Stang)
Scale: 1" = 2.5 Miles

Exhibit C



Zone 41 Service Area

Sacramento County Water Agency (SCWA)

 SCWA Zone 41 Service Area

0 1/2 1
SCALE IN MILES



Date: May 20, 2002
By: SCWA (R. Saeg)
Scale: 1" = 2.5 Miles

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed as of the day and year first written above.

SACRAMENTO COUNTY WATER AGENCY, a political subdivision of the State of California



By [Signature]
Vice Chairman of the Board of Directors of Sacramento County Water Agency

[Signature]
Clerk of the Board of Sacramento County Water Agency

REVIEWED AND APPROVED BY COUNTY COUNSEL:

[Signature]
Deputy County Counsel

FLORIN RESOURCES CONSERVATION DISTRICT

Attest:

[Signature]
Secretary,
Florin Resources Conservation District

By [Signature]
Gail A. Woodson, Chairperson
Board of Directors

Reviewed and Approved by District Council

[Signature] 6/21/02
District Council

with signature/2007/06/21 and secretary/2007/06/21 and chairman/2007/06/21

APPENDIX C

Unit Water Demands



APPENDIX C
FORMULATION OF UNIT WATER DEMANDS WITH
WATER CONSERVATION

1.1 INTRODUCTION

The water planning efforts of Zone 40 began with the establishment of unit water demand factors for the Water Supply Master Plan (WSMP) area. This process began in the late 1980's when initial demand estimates were set at 3.3 acre-feet per acre per year (AF/Ac/Yr) based on calculations performed by the State Department of Water Resources for long-range planning. The use of the 3.3 AF/Ac/Yr factor is reflected in the 1987 Zone 40 Water Supply Master Plan (1987, James M. Montgomery).

Unit water demands are typically calculated and categorized based on land use, which is preferable over population methods for calculating water demand. Estimating a water demand factor for a specific land use category requires meter data from accounts of the land use category where data has to be of a statistically significant size. The units used for land use based water demand factors are typically gallons per day per acre (GPD/Ac), gallons per day per residential dwelling unit (GPD/DU), or AF/Ac/Yr.

Unit demand factors for Zone 40 have been established through two separate studies: *the 1995 Zone 40 Master Plan Update* (Montgomery Watson, June 1995) (1995 Master Plan), and *the Estimate of Annual Water Demand Within the Sacramento County-Wide Area* (May 1995, Boyle Engineering) (Boyle Study). The Sacramento Area Water Forum (Water Forum) used the Boyle Study to estimate demand whereas the Zone 40 WSMP used the 1995 Master Plan numbers. At the time the Boyle Study was conducted, meters were just beginning to be installed in Zone 40 and there were only a few commercial customers during the 1980's and 1990's. As a result, the Water Forum applied the assumptions and approximations from the Boyle Study unit water demand factors to Zone 40. Because the water demand data collection portion of the 1995 Master Plan took place a few years after the Boyle Study, meter data was available for a unit water demand evaluation. As a result, two sets of water demand factors have been used to estimate water demands in Zone 40, a set based on the Boyle Study and another set based on the 1995 Master Plan. The discussion below provides a brief summary of the differences and the implications of the use of one unit demand factor over another.

1.2 UNIT WATER DEMAND FACTORS

The Boyle Study estimated water demand factors for land uses within Zone 40 by using the unit demand factors developed for the City of Sacramento (City) (*Estimate of Ultimate Annual Water Use, October 1991, Boyle Engineering*) (1991 City Demand Study). To determine these factors for Zone 40, Boyle modified the City's unit demand factors by scaling each land use demand factor until total water use matched the actual water use data (1990) reported by Zone 40. An exception to the method of scaling unit demand factors involved industrial land uses where the study developed new water demand factors that account for both utilized and unutilized industrial areas. The principal assumption made in this methodology is that the ratio between the unit demand factors for Zone 40 and those developed in the 1991 City Demand Study are the same for all land use categories. Normalization of the demand factors also took place to take into account that the study year is not the design year upon which the unit demand factors are used for. This is described in more detail in the section below.

The 1995 Master Plan estimated water demand factors for land uses within Zone 40 using the unit demand factors developed for the Sacramento Area (*Estimate of Ultimate Annual Water Demand within the Sacramento Metropolitan Area, April 1993, Boyle Engineering*) (1993 Sacramento Area Water Demand Study). The methodology used to develop unit demand factors for Zone 40 was to modify the unit demand factors from the 1993 Sacramento Area Water Demand Study by scaling each land use demand factor until the total water use matched actual 1992 total water use. This analysis used 1991 land use information and actual water use data (1992) obtained from Zone 40 and from other water agencies of similar age and type of land use categories. This methodology made two primary assumptions: (1) land use conditions in Zone 40 did not change between 1991 and 1992, and (2) the ratio between unit demand factors for Zone 40 and those developed in the 1993 Sacramento Area Water Demand Study are the same. The unit water demand factors developed through this process are considered to represent future normal year conditions assuming conservation levels will not change in the future.

Both the Boyle Study and the 1995 Master Plan used similar methodologies to develop unit water demand factors for Zone 40. However, because of the limitations in water use data availability at the time of each study, significant differences exist between the water demand factors developed by each of the studies. **Table C-1** and **Table C-2** list the unit water demand factors developed by the Boyle Study and by the 1995 Master Plan. The 1995 Master Plan unit water demand factors are consistently lower than those estimated by the Boyle Study, which is representative of the completeness and quality of the water use data used by each study.

Since unit water demands factors are used to calculate future water needs, they provide the basis for estimation of future water supply. The Water Forum Agreement (WFA), signed by the County of Sacramento and Sacramento County Water Agency (County/SCWA) in January 2000, governs the amount of surface water and groundwater available to each region of Sacramento County. To ensure consistency between the WFA estimates and those provided by the unit demand factors developed in the 1995 Master Plan, a reconciliation study was made (*Zone 40 and Water Forum Agreement Reconciliation, Montgomery Watson Harza, 2001*). The study found that estimates of water demands in Zone 40 provided by both WFA and the 1995 Master Plan closely match and that no significant discrepancies exists, when conservation factors are adjusted. In both the Boyle Study and the 1995 Master Plan, water conservation levels were assumed to be at 8 percent, however, under the year 2030 water conservation levels of 25.6 percent are assumed. **Table C-1** and **Table C-2** list the unit water demand factors for Zone 40 developed by the Boyle Study and by the 1995 Master Plan for both 8 and 25.6 percent conservation levels.

Table C-1. Boyle Unit Water Demand Factors

Land Use Category	Unit Water Demand (AF/Ac/Yr)	
	8% Conservation	25.6% Conservation
Rural Estates	1.42	1.15
Single Family Low Density	3.04	2.46
Multi-Family Medium Density	4.00	3.23
Multi Family High Density	4.44	3.59
Commercial and Office	3.56	2.88
High Rise Regional Office (not used)		
Light Industrial	3.46	2.80
Heavy Industrial (not used)		
Public, Quasi-Public, Cemeteries, and Misc.	0.69	0.56
Public Recreation	3.77	3.05
Mixed Land Uses	2.50	2.02
Right of Way	0.22	0.18
Notes: 1. Unit Water Demand Factors have been adjusted for water conservation. 1990 water conservation levels were assumed to be 8 percent. Under the Water Forum Agreement, 2030 water conservation levels are assumed to be 25.6 percent. This results in the following conversion of unit water demand factors: $1/(1-0.08)*(1-0.256)$		

Table C-2. 1995 Master Plan Unit Water Demand Factors

Land Use Category	Unit Water Demand (AF/Ac/Yr)	
	8% Conservation	25.6% Conservation
Rural Estates	0.29	0.23
Single Family Low Density	2.49	2.01
Multi-Family Medium Density	3.28	2.65
Multi Family High Density	3.63	2.94
Commercial and Office	2.91	2.35
High Rise Regional Office (not used)		
Light Industrial	2.83	2.29
Heavy Industrial (not used)		
Public, Quasi-Public, Cemeteries, and Misc.	0.57	0.46
Public Recreation	0.77	0.62
Mixed Land Uses	2.05	1.66
Right of Way	0.18	0.15
Notes: 1. Unit Water Demand Factors have been adjusted for water conservation. 1990 water conservation levels were assumed to be 8 percent. Under the Water Forum Agreement, 2030 water conservation levels are assumed to be 25.6 percent. This results in the following conversion of unit water demand factors: $1/(1-0.08)*(1-0.256)$		

1.3 NORMALIZATION OF WATER DEMANDS

Because of fluctuations in water demand based on hydrologic conditions and consumer water conservation awareness, normalization of land use unit water demand factors is required and was conducted to some extent in both the Boyle Study and 1995 Master Plan. Water demands are inherently higher in dry hotter years because of increased outdoor irrigation needs. However, water conservation awareness is also higher in dry years resulting in a lowering of water demands based on water conservation education efforts. Historical data indicates that water use is typically highest in a dry year after multiple wet years because of the time necessary to re-educate consumers. Both the 1995 Master Plan and the Boyle Study assume that maximum water use occurs in normal years and that in both dry and wet years water demand would be as much as 15 percent lower than normal years.

For the purpose of ensuring long-term reliability of the water system, normalization of data requires assessing potentially extreme conditions and adjusting the unit demand factors accordingly. Normalization of water demands is achieved by evaluating per capita demands on an annual basis and considering the high water use years as the years to design for (see **Figure C-1**). For example, the total annual water into the system and per capita water production data over the last 20 years can be plotted. From this curve, the extreme years can easily be detected and a determination made on which to base future water system design. Normalizing to the average of the extreme years provides a design reliability to meet water demands in 90 percent of the years. Typically, the cost effectiveness of water facilities is significantly reduced if designed to a level greater than 90 percent of the demand years. Water supply in the remaining 10 percent of the peak demand years can be achieved through water conservation and other demand reduction strategies that can be implemented to meet water demands in peak years.

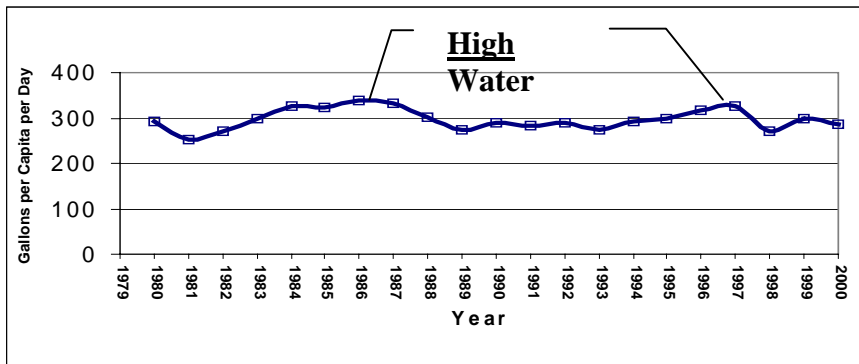


Figure C-1. Example of Per Capita Water Use in Sacramento Area

TM 2 - ZONE 40 WATER FORUM RECONCILIATION

SECTION 1 - INTRODUCTION
SACRAMENTO COUNTY DEPARTMENT OF WATER RESOURCES
TM 2 - ZONE 40 WATER FORUM RECONCILIATION

SECTION 1 - INTRODUCTION

Zone 40 of the Sacramento County Water Agency (SCWA) is currently in the process of updating their Water Supply Master Plan (WSMP). SCWA's Zone 40 provides the majority of water to an area defined by the Water Forum as the South County Conjunctive Use Area (See **Figure 1-1**) represented by the South County Municipal and Industrial (M&I) users group. Water needs within the South County Conjunctive Use Area provide the basis for the amounts of surface water and groundwater specified in the Water Forum Agreement (WFA) signed by the County of Sacramento and SCWA (County/SCWA) in January 2000.

To assist in the review of the WSMP and its consistency with the Water Forum Agreement, the County/SCWA has prepared this Technical Memorandum (TM) that carefully reviews the purveyor specific WFA language, and reconciles the Zone 40 WSMP's various planning assumptions with this language.

1.4 PRINCIPAL OBJECTIVES

The objectives of this TM are to:

1. Compare the WFA's stated water need for County/SCWA and what is shown in the WSMP.
2. Explain the development of County/SCWA's total surface water requirements and any differences with the WFA.
3. Describe the estimated groundwater use in the County/SCWA Zone 40 service area and any differences with the WFA.

SECTION 1 - INTRODUCTION
SACRAMENTO COUNTY DEPARTMENT OF WATER RESOURCES
TM 2 - ZONE 40 WATER FORUM RECONCILIATION

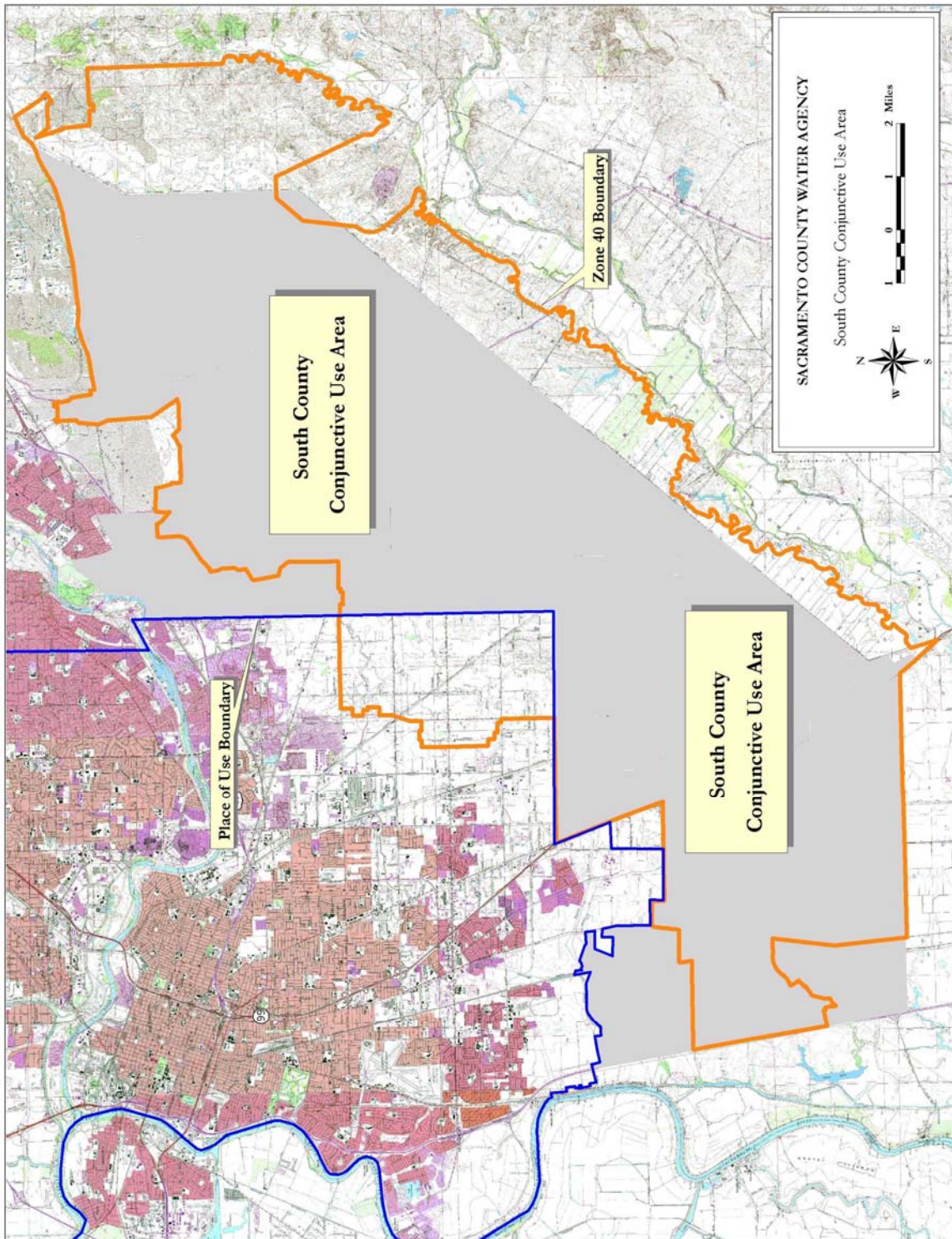


Figure 1-1. Study Area Map

SECTION 1 - INTRODUCTION
SACRAMENTO COUNTY DEPARTMENT OF WATER RESOURCES
TM 2 - ZONE 40 WATER FORUM RECONCILIATION

1.5 WATER FORUM AGREEMENT

The WFA provides a set of planning guidelines that, when adhered to, provides the County/SCWA with significant endorsement for proposed projects from the various interest groups who are signatory to said agreement. Section D of the County/SCWA's Purveyor Specific Agreement describes total water needs and use of surface water and groundwater. This section is provided below:

"D. AGREEMENT FOR MEETING THE COUNTY OF SACRAMENTO'S AND THE SACRAMENTO COUNTY WATER AGENCY'S WATER SUPPLY NEEDS TO THE YEAR 2030

The County/SCWA surface water needs are included in the South County M&I users group. The County/SCWA portion of the demand, 87,000 AF, includes both existing and expanded Zone 40 areas. It is anticipated that Zone 40 will be expanded to include large areas in the southern part of Sacramento County which may be developed that are presently unorganized.

To meet these demands, the firm surface water supply of 45,000 AF (15,000 AF of USBR contract water under PL 101-514 and 30,000 AF of SMUD entitlement transfer), an intermittent surface water supply of 33,000 AF, and groundwater will be necessary. The PL 101-514 and SMUD water will be subject to shortages imposed on all CVP M&I contractors. Intermittent surface water is available only when the water is surplus to the needs of the San Joaquin-Sacramento River and Delta. Upstream water transfers will be pursued to reduce reliance on intermittent surface water. All of the surface water for the County/SCWA is assumed to be diverted at or near the mouth of the American River or from the Sacramento River.

Groundwater will be used in a conjunctive use basis by the South County M&I users group with a total 2030 demand of 117,600 AF. The South County M&I users group also includes a portion of Citizens Utilities Company and the Elk Grove Water Works. The amount of groundwater used will vary from approximately 95,100 AF in the driest years decreasing to approximately 34,000 AF in the wet years."

1.6 OVERVIEW OF TECHNICAL MEMORANDUM

This TM is organized into the following sections:

- **Section 1: Introduction** provides background information and includes the pertinent sections of the WFA.
- **Section 2: Water Need** considers the WFA language related to water demands and compares the water demand formulation completed during the Water Forum process with that used in the WSMP.

SECTION 1 - INTRODUCTION
SACRAMENTO COUNTY DEPARTMENT OF WATER RESOURCES
TM 2 - ZONE 40 WATER FORUM RECONCILIATION

- **Section 3: Water Supplies** describes the basis for the WSMP's stated surface water and groundwater supplies and compares them with those stated in the WFA.

- **Section 4: Principal Findings** summarizes the results and ties them back to the principal objectives.

Sections 2 through 4 are organized by starting each point of discussion with an excerpt from the WFA's Section D, as stated above. Figures and tables are interspersed throughout this document to provide clarification on each of the discussion points.

SECTION 2 – WATER NEEDS
SACRAMENTO COUNTY DEPARTMENT OF WATER RESOURCES
TM 2 - ZONE 40 WATER FORUM RECONCILIATION

SECTION 2 - WATER NEEDS

AGREEMENT FOR MEETING THE COUNTY OF SACRAMENTO’S AND THE SACRAMENTO COUNTY WATER AGENCY’S WATER SUPPLY NEEDS TO THE YEAR 2030

A planning horizon of 2030 is used in both the Water Forum and the WSMP. Two levels of build-out are considered when evaluating levels of planned growth. The *Sacramento County General Plan’s* (General Plan) Urban Policy Area boundary represents the near term build-out to 2025, with a total population of 1,939,000 based on Department of Finance projections. The Urban Services Boundary represents ultimate build-out to 2050, with a population of 2,678,000. The population at 2030, based on linear interpolation between near term and ultimate build-out, is estimated to be 2,092,000.

The WSMP considers a service area (See **Figure 1-1**) that includes near term build-out of urbanized areas within the Urban Policy Area, and areas that are within agricultural-residential areas and have densities greater than one home for every two acres (General Plan Policy LU-48 requires public water supplies at these densities).

THE COUNTY/SCWA SURFACE WATER NEEDS ARE INCLUDED IN THE SOUTH COUNTY M&I USERS GROUP. THE COUNTY/SCWA PORTION OF THE DEMAND, 87,000 AF, INCLUDES BOTH EXISTING AND EXPANDED ZONE 40 AREAS.

GROUNDWATER WILL BE USED IN A CONJUNCTIVE USE BASIS BY THE SOUTH COUNTY M&I USERS GROUP WITH A TOTAL 2030 DEMAND OF 117,600 AF. THE SOUTH COUNTY M&I USERS GROUP ALSO INCLUDES A PORTION OF CITIZENS UTILITIES COMPANY AND THE ELK GROVE WATER WORKS.

SECTION 2 – WATER NEEDS
SACRAMENTO COUNTY DEPARTMENT OF WATER RESOURCES
TM 2 - ZONE 40 WATER FORUM RECONCILIATION

The key questions in a comparison of identified water needs for the County/SCWA in the WFA and the WSMP are as follows. 1) Why does the WFA identify a County/SCWA water need of 87,000 AF and the WSMP identify a water need of 108,700 AF and 2) how does the WSMP need of 108,700 AF relate to the total 2030 WFA demand of 117,600 AF?

In the six years leading up to the adoption of the Water Forum Agreement, numerous engineering studies were conducted to develop a thorough understanding of water demands and the availability of groundwater and surface water supplies. Water demands estimated in the *Estimate of Annual Water Demand Within the Sacramento County-Wide Area* (Boyle Engineering Corporation, May 1995) provided the basis for the Water Forum’s recommended development and implementation of regional conjunctive use plans involving groundwater and surface water supplies.

Comparison of the Water Forum’s water needs for County/SCWA of 87,000 AF with the needs identified in the WSMP requires a detailed review of each of the sub-areas that constitute the South County M&I users group. The colored regions shown in **Figure 2-1** represent the sub-regions used in the *Estimate of Annual Water Demand Within the Sacramento County-Wide Area* report. (The appendix provides a further breakdown of each sub-region into sub-areas.) The tables below summarize for each land use type in each sub-region, the acreage and total water demand for the Water Forum and the WSMP. All water demands are expressed at the 25.6% conservation level. Detailed breakdown information on each sub-region is provided in the appendix.

All data included in the tables for the Water Forum is obtained through work documented in the *Estimate of Annual Water Demand Within the Sacramento County-Wide Area* report and supplemental data developed for the Water Forum. This report provides results for near term build-out of the Urban Policy Area (Year 2025) and ultimate build-out of the Urban Services Boundary (Year 2050). Linear interpolation based on population was performed on land use areas to generate land use acreage that are representative of year 2030. In addition, the water demand factors were adjusted based on the Water Forum’s water conservation goal of 25.6 percent conservation levels for 2030.

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Data for the WSMP is extracted from the various reference documents completed for Zone 40 over the past 7 years. These include: *Draft Zone 40 Water Supply Master Plan Update 2001*, *Zone 40 Water Supply Master Plan Update* (Montgomery Watson, June 1995), *Water Master Plan for Areas Adjacent to the Zone 40 Water Supply Master Plan Update's Study Area* (West Yost, March 1998), *Sunrise Douglas Water Supply Master Plan Framework Evaluation*, and *Elliott Ranch South (now known as Laguna-Stonelake) Water Supply Master Plan*. In some instances, study areas in the WSMP overlap more than one sub-region in the Water Forum. In this case, WSMP study areas were split and an approximation in the division of land uses was made while maintaining the integrity of the total land use acreage (See appendix figure). Additionally, water demand factors and system losses in the WSMP differ from the Water Forum analysis. The WSMP demand factors and system losses are based on more detailed analysis completed as part of the master plan development and are preferred over the Water Forum factors.

Many of the differences in M&I areas between the Water Forum and the WSMP can be attributed to the Water Forum's inclusion of areas outside the Urban Policy Area for the increment of development that occurs from near term build-out (Year 2025) to 2030. Whereas, Zone 40 only limits its service area outside the Urban Policy areas to agricultural-residential (rural estates) areas requiring public water service.

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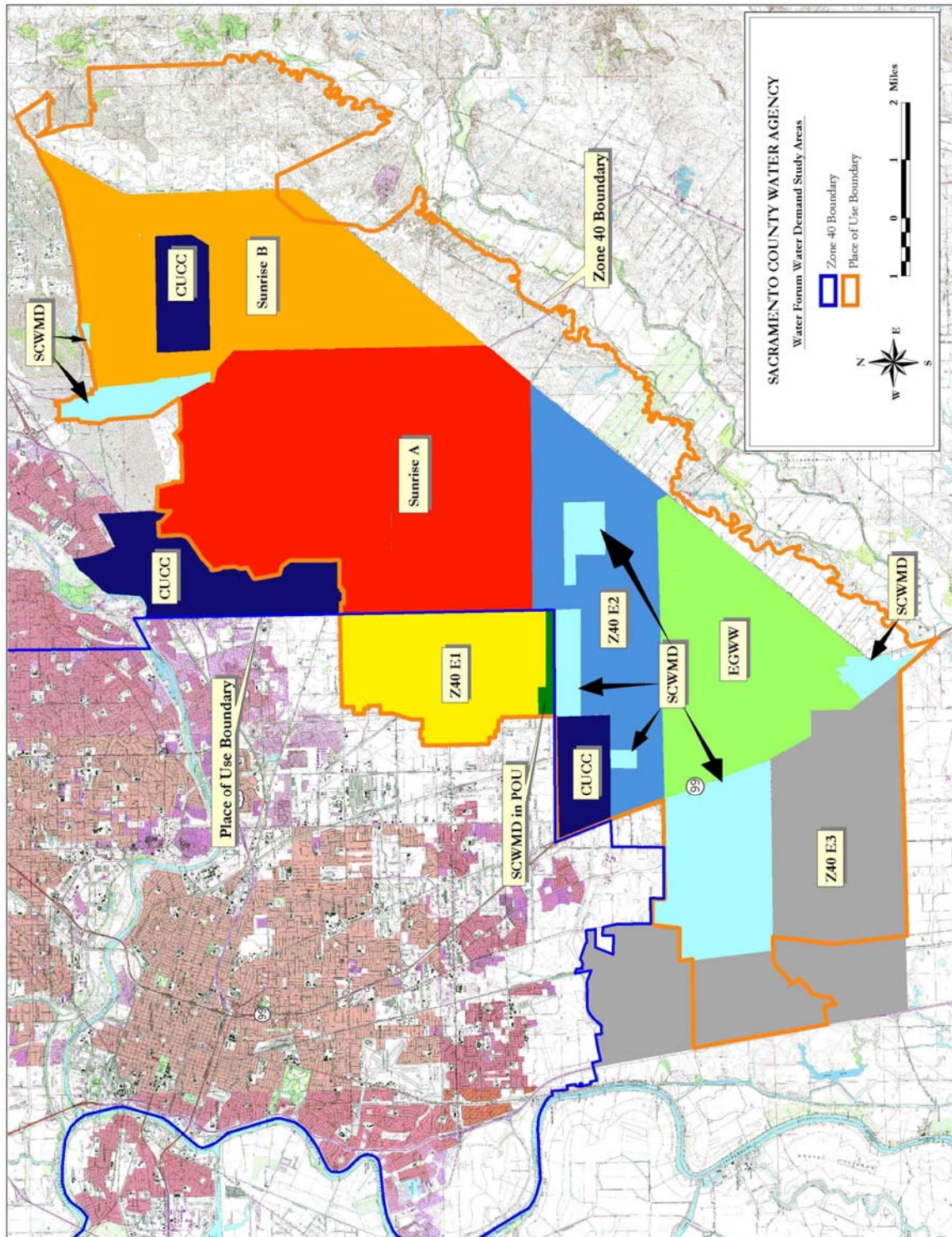


Figure 2-1. Water Forum Water Demand Study Areas

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Table 2-1. Sunrise A

Sunrise A Land Use	Water Forum		Zone 40	
	Acres	Demand (AFA)	Acres	Demand (AFA)
Rural Estates	1,015	296	630	841
Single Family	987	2,459	768	2,217
Multi Family Low	112	367	17	63
Multi Family High	277	1,006	-	-
Commercial	75	218	59	162
Industrial	1,035	2,931	196	531
Public	89	50	784	812
Public Recreation	332	255	1,378	4,770
Agriculture	6,489	5,840	-	-
Vacant	92	-	2,950	-
Right of Way	628	112	216	51
Mixed Land Uses	-	-	2,086	5,230
Urban Study Area	6,263	12,819	-	-
Industrial Unutilized	1,591	-	-	-
System Losses		2,044		1,190
Total	18,986	28,397	9,084	15,865
Total M&I	10,906	22,558	9,084	15,865

Development areas within Sunrise A requiring M&I water supplies are in the north and south. In the north is Mather Field and portions of the Citizens service area. In the south are areas of mixed land uses made up of future urban development areas and rural estates. In the middle portions of Sunrise A are a significant number of agricultural, aggregate mining (industrial unutilized), and industrial activities that are outside the Urban Policy Area and will continue to be served by private wells. The Water Forum M&I area and water demands are adjusted to remove self supplied agricultural and unutilized land uses not included in the Zone 40 WSMP. The difference between the Water Forum M&I area and the Zone 40 WSMP area is approximately 1,820 acres. This difference is a result of the Water Forum’s inclusion of 400 acres of Citizens’ Rosemont service area and including privately served industrial areas.

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Table 2-2. Sunrise B

Sunrise B	Water Forum		Zone 40	
	Acres	Demand (AFA)	Acres	Demand (AFA)
Rural Estates	46	13	-	-
Single Family	384	956	4,719	13,624
Multi Family Low	46	151	130	482
Multi Family High	115	418	-	-
Commercial	31	89	360	989
Industrial	1,013	2,869	-	-
Public	-	-	-	-
Public Recreation	243	187	326	1,127
Agriculture	1,723	1,550	-	-
Vacant	38	-	-	-
Right of Way	299	53	507	123
Mixed Land Uses	-	-	-	-
Urban Study Area	5,892	12,059	-	-
Industrial Unutilized	1,692	-	-	-
System Losses		1,720		1,325
Total	11,521	20,066	6,042	17,672
Total M&I	8,107	18,516	6,042	17,672

Development within Sunrise B is focused in the middle regions represented by the Sunrise Douglas Community Plan development area. The northern portions of Sunrise B that are outside the Urban Policy Area are zoned industrial and industrial unutilized. Self-supplied agricultural uses are located in the southern portions. The Water Forum M&I area and water demands are adjusted to remove agricultural, and unutilized industrial self supplied areas not included in the Zone 40 WSMP. The difference between the Water Forum M&I area and the Zone 40 WSMP area is approximately 2,065 acres. This difference is a result of the Water Forum’s growth assumptions in areas outside the Urban Policy Area from near term build-out (2025) to 2030 that are not included in the Zone 40 WSMP for Sunrise B.

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Table 2-3. Expanded Zone 40 Area No. 2 (Z40 E2)

Z40 E2	Water Forum		Zone 40	
	Acres	Demand (AFA)	Acres	Demand (AFA)
Rural Estates	2,516	733	291	297
Single Family	2,307	5,747	326	941
Multi Family Low	251	822	249	922
Multi Family High	73	266	-	-
Commercial	94	274	108	297
Industrial	15	42	45	122
Public	-	-	-	-
Public Recreation	409	314	200	692
Agriculture	507	588	-	-
Vacant	-	-	904	-
Right of Way	364	65	315	65
Mixed Land Uses	324	663	3,083	7,729
Urban Study Area	1	1	-	-
Industrial Unutilized	14	-	-	-
System Losses		875		897
Total	6,873	10,390	5,521	11,962
Total M&I	6,352	9,802	5,521	11,962

Z40E2 represents the Vintage Park and Vineyard areas of Zone 40. Urban development and small self supplied rural estates areas are predominant in the western one-third. In the middle portion are mixed land uses and, in the east, self-supplied agriculture and agriculture-residential areas. The Water Forum area and water demands are adjusted downward for self supplied agricultural uses not included in the Zone 40 WSMP. The difference in area of 831 acres is attributed to the Water Forum inclusion of rural estate areas outside of the Zone 40 WSMP boundary.

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Table 2-4. Expanded Zone 40 Area No. 3 (Z40 E3)

Z40 E3	Water Forum		Zone 40	
	Acres	Demand (AFA)	Acres	Demand (AFA)
Rural Estates	-	-	15	20
Single Family	4,603	11,470	4,223	12,192
Multi Family Low	294	963	196	725
Multi Family High	52	188	-	-
Commercial	163	475	108	296
Industrial	128	364	217	587
Public	1,779	1,007	142	147
Public Recreation	316	243	381	1,295
Agriculture	2,151	2,495	-	-
Vacant	2,368	-	295	-
Right of Way	547	97	416	87
Mixed Land Uses	599	1,225	3,170	7,947
Urban Study Area	570	1,166	-	-
Industrial Unutilized	194	-	-	-
System Losses		1,686		1,889
Total	13,764	21,379	9,161	25,184
Total M&I	11,419	18,884	9,161	25,184

Z40E3 represents the East Franklin and Laguna West areas of Zone 40. Future urban development is predominant throughout this region. In southwest portions there are self-supplied agriculture areas and vacant lands, and, in the northwest, the Sacramento Regional County Sanitation District and associated bufferlands. The Water Forum area and water demands are adjusted for industrial unutilized, and agricultural land uses not included in the Zone 40 WSMP. The resulting M&I acreages of the Water Forum and the WSMP differ by 2,260 acres which closely approximates the vacant area included in the Water Forum but not in the Zone 40 WSMP.

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Table 2-5. Elk Grove Water Works (EGWW)

EGWW	Water Forum		Zone 40	
	Acres	Demand (AFA)	Acres	Demand (AFA)
Rural Estates	1,746	2,035	449	504
Single Family	2,770	6,901	1,983	5,706
Multi Family Low	59	193	-	-
Multi Family High	46	167	-	-
Commercial	379	1,105	80	220
Industrial	113	319	4	8
Public	-	-	-	-
Public Recreation	718	2,220	75	260
Agriculture	-	-	-	-
Vacant	15	-	-	-
Right of Way	764	136	208	42
Mixed Land Uses	73	148	2,300	5,766
Urban Study Area	1,388	2,841	-	-
Industrial Unutilized	170	-	-	-
System Losses		600		1,014
Total	8,240	16,665	5,099	13,520
Total M&I	8,071	16,665	5,099	13,520

The western portion of EGWW represents the developed areas of the City of Elk Grove and the East Elk Grove area. The eastern half is predominantly agriculture-residential. The subregion is contained entirely within the M&I service area so no adjustment in acreage or demand is made to the Water Forum projections. The difference of 2,972 acres between the Water Forum and the WSMP is attributed to the Water Forum including the EGWW exclusive franchise area which is not served by Zone 40.

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Table 2-6. Citizens Utilities Company of California (CUCC)

CUCC Land Use	Water Forum		Zone 40	
	Acres	Demand (AFA)	Acres	Demand (AFA)
Rural Estates	73	89	-	-
Single Family	1,981	5,258	-	-
Multi Family Low	195	665	-	-
Multi Family High	49	187	-	-
Commercial	191	874	-	-
Industrial	954	4,362	497	1,345
Public	89	84	-	-
Public Recreation	70	253	-	-
Agriculture	-	-	-	-
Vacant	-	-	-	-
Right of Way	746	139	-	-
Mixed Land Uses	191	391	-	-
Urban Study Area	95	195	-	-
Industrial Unutilized	1,561	-	-	-
System Losses		1,560		109
Total	6,196	14,057	497	1,455
Total M&I	4,635	14,057	497	1,455

The CUCC subregion represents the developed areas of CUCC’s service area known as the Countryside and Rosemont service areas, and the undeveloped area of the Security Park service area. The collective subregion is contained entirely within the M&I service area so no adjustment in acreage or demand is made to the Water Forum projections. The difference of 4,138 acres between the Water Forum and the WSMP is attributed to the Water Forum including the Countryside and Rosemont service areas. These areas are not included in the Zone 40 WSMP.

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Table 2-7. Sacramento County Water Maintenance District (SCWMD) outside Place of Use (POU)

SCWMD outside POU	Water Forum		Zone 40	
	Acres	Demand (AFA)	Acres	Demand (AFA)
Rural Estates	511	553	73	97
Single Family	2,926	6,817	2,596	7,495
Multi Family Low	306	917	495	1,833
Multi Family High	-	-	-	-
Commercial	169	472	239	657
Industrial	571	1,378	1,291	3,498
Public	119	99	384	397
Public Recreation	621	2,174	485	1,679
Agriculture	0	1	12	23
Vacant	-	-	242	-
Right of Way	757	135	727	155
Mixed Land Uses	139	285	139	348
Urban Study Area	0	0	-	-
Industrial Unutilized	890	-	523	-
System Losses		1,253		1,310
Total	7,009	14,084	7,207	17,495
Total M&I	7,009	14,084	7,207	17,472

The SCWMD area outside the American River Place of Use subregion represents the developed areas of SCWMD’s service area known as the Laguna, Vintage Park, Calvine/Power Inn, Country Creek Estates, Sunrise Corridor, and Grantline/99 service areas. The collective subregion is contained entirely within the M&I service area so no adjustment in acreage or demand is made to the Water Forum projections. The difference of 200 acres between the Water Forum and the WSMP is partially attributed to a difference of 100 acres for the Grantline/99 service area. The Water Forum uses 451 acres and the WSMP uses 550 acres (the WSMP included additional service area to the south).

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**Table 2-8. Expanded Zone 40 Area No. 1 (Z40 E1) inside
Place of Use (POU)**

Z40 E1	Water Forum		Zone 40	
	Acres	Demand (AFA)	Acres	Demand (AFA)
Rural Estates	-	-	-	-
Single Family	346	862	1,164	3,361
Multi Family Low	17	54	86	319
Multi Family High	42	151	-	-
Commercial	11	32	41	113
Industrial	31	88	-	-
Public	-	-	10	10
Public Recreation	266	204	56	194
Agriculture	-	-	-	-
Vacant	1,213	-	757	-
Right of Way	275	49	156	33
Mixed Land Uses	-	-	1,778	4,457
Urban Study Area	3,145	6,437	-	-
Industrial Unutilized	43	-	-	-
System Losses		789		688
Total	5,388	8,667	4,048	9,174
Total M&I	5,345	8,667	4,048	9,174

Z40E1 is entirely located within the American River Place of Use. The northern one-third portion is vacant or has industrial land uses, and the remaining portion is planned urban development. The Water Forum M&I area and water demand were adjusted to remove unutilized industrial self supplied land uses not included in the Zone 40 WSMP. The difference of 1,300 acres between the Water Forum M&I area and the Zone 40 WSMP area is attributed to the vacant area not included in the Zone 40 WSMP.

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**Table 2-9. Sacramento County Water Maintenance District (SCWMD)
inside Place of Use (POU)**

SCWMD inside POU	Water Forum		Zone 40	
	Acres	Demand (AFA)	Acres	Demand (AFA)
Rural Estates	-	-	-	-
Single Family	207	483	242	699
Multi Family Low	11	32	-	-
Multi Family High	-	-	-	-
Commercial	11	32	-	-
Industrial	-	-	-	-
Public	-	-	-	-
Public Recreation	-	-	-	-
Agriculture	-	-	-	-
Vacant	-	-	-	-
Right of Way	32	6	20	4
Mixed Land Uses	-	-	-	-
Urban Study Area	1	2	-	-
Industrial Unutilized	-	-	-	-
System Losses		55		57
Total	262	609	262	760
Total M&I	262	609	262	760

SCWMD is entirely located within the American River Place of Use and there is no difference between the Water Forum M&I area and the Zone 40 WSMP area.

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WATER DEMAND SUMMARY

The summary table below summarizes the subregion tables to provide a meaningful comparison of total acreage and water demand between the WFA and the WSMP.

Table 2-10. Water Forum and Zone 40 WSMP Water Demands

Subregion	Water Forum		Zone 40	
	Acres	Demand (AFA)	Acres	Demand (AFA)
Sunrise A	10,906	22,558	9,084	15,865
Sunrise B	8,107	18,516	6,042	17,672
Z40 E2	6,352	9,802	5,521	11,962
Z40 E3	11,419	18,884	9,161	25,184
SCWMD outside POU	7,009	14,083	7,207	17,472
Total County/SCWMD	43,792	83,843	37,015	88,155
EGWW	8,071	16,665	5,099	13,520
CUCC	4,635	14,057	497	1,455
Total South County Conjunctive Use Area	56,498	114,565	42,611	103,130
Water Forum Areas Not in Zone 40	(14,753)	(18,445)		
Total Zone 40 Outside POU	41,745	96,120	42,611	103,130
Z40 E1	4,048	8,667	4,048	9,174
SCWMD inside POU	262	609	262	760
Total Zone 40	46,054	105,396	46,921	113,064
Recycled Water		(0)		(4,400)
Total Zone 40 Conjunctive Use Area		105,396		108,664

SECTION 2 – WATER NEEDS
SACRAMENTO COUNTY DEPARTMENT OF WATER RESOURCES
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The first five subregions in Table 2-10 represent the area to be retailed by the County/SCWA. The sum of these five areas under the Water Forum column results in 83,843 AF. This number equates to the 87,000 AF when the agricultural demand for Z40E2 (588 AF) and Z40E3 (2,495 AF) are added back into the total demand. The reason for the Water Forum including the agricultural water demand in only these two subregions is unclear. It is believed that the agricultural demand should have been removed from all subregions when calculating the total M&I demand.

The next two subregions are included in the South County Conjunctive Use area with only a portion of each in the Zone 40 WSMP study area. The total South County Conjunctive Use Area water demand of 114,566 AF equates to the 117,000 AF Water Forum water demand when the agricultural demand is added in for Z40E2 and Z40E3 as above.

The next removes areas and water demands from the Water Forum column because the Water Forum includes some areas not in the WSMP study area such as EGWW's exclusive franchise area, Citizen's Rosemont and Countryside service areas, and other non M&I subareas that are identified as not being within the Zone 40 study area (see Appendix map). To account for areas served by Zone 40 within the American River POU, the two subregions representing that area are added into both the Water Forum and Zone 40 water demands. Lastly, in order to compare conjunctive use water demands, recycled water is subtracted from the Zone 40 total only since the Water Forum does not consider recycled water. The Zone 40 108,700 AF of conjunctive use water demand is equated to the Water Forum's 105,400 AF. The Water Forum and Zone 40 M&I areas are approximately the same at 46,800 acres.

IT IS ANTICIPATED THAT ZONE 40 WILL BE EXPANDED TO INCLUDE LARGE AREAS IN THE SOUTHERN PART OF SACRAMENTO COUNTY WHICH MAY BE DEVELOPED THAT ARE PRESENTLY UNORGANIZED.

SECTION 2 – WATER NEEDS
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Expansion of Zone 40 was completed in April 1999. The expanded areas include both organized and unorganized areas in the expanded area. The organized area includes CUCC's Security Park service area located east of Sunrise Boulevard and north of Douglas Road. The inclusion of this area is based on CUCC's request to have the ability to participate in Zone 40 and receive wholesale water supplies when they become available. Areas to be retailed by the County/SCWA represent the remaining areas.

SECTION 3 – SURFACE WATER SUPPLIES
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TM 2 - ZONE 40 WATER FORUM RECONCILIATION

SECTION 3 - SURFACE WATER SUPPLIES

TO MEET THESE DEMANDS, THE FIRM SURFACE WATER SUPPLY OF 45,000 AF (15,000 AF OF USBR CONTRACT WATER UNDER PL 101-514 AND 30,000 AF OF SMUD ENTITLEMENT TRANSFER), AN INTERMITTENT SURFACE WATER SUPPLY OF 33,000 AF, AND GROUNDWATER WILL BE NECESSARY.

A brief description of County/SCWA's existing and proposed surface water contracts is provided below.

In April 1999 County/SCWA obtained a Central Valley Project (CVP) water service contract for 15,000 AF pursuant to PL 101-514. An agreement-in-principle has been signed between Sacramento Municipal Utility District (SMUD), the City of Sacramento, and SCWA for the assignment of 15,000 acre-feet annually (AFA) of water under an amendment to SMUD's existing U.S. Bureau of Reclamation contract to be treated and conveyed through the City's facilities to SCWA Zone 40. A second SMUD water assignment of 15,000 AFA to County/SCWA is also being developed that will also assist SMUD in meeting its future dry year water requirements through a groundwater recharge recovery program (WFA, p. 283). The total expected CVP supply for Zone 40 is 45,000 AF.

On May 30, 1995, the County/SCWA Board approved the submittal of an application to the State Water Resources Control Board for the appropriation of water from the American and Sacramento Rivers. The amount of American River water available would be dependent on meeting Hodge Decision criteria (American River only), existing riparian water rights, existing appropriated water rights, federal and state project water, and water needed for Delta outflow requirements and other environmental resource protection criteria. This water is considered to be an intermittent supply so significant quantities will likely be available only in the wet and normal years. The County/SCWA will also seek Section 215 water (spill water) when it is available through the CVP based on the same conditions as appropriated water. These waters are included as part of the total intermittent supply.

SECTION 3 – SURFACE WATER SUPPLIES
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The County/SCWA WSMP planning assumptions for surface water supplies match closely to the WFA stated amounts; however, the WSMP has stated higher diversions of intermittent water supplies. The WFA's development of 33,000 AF of intermittent supplies is based on conjunctive use modeling conducted for the Water Forum. Water Forum model results indicate a maximum surface water use for the South County Conjunctive Use Area of 78,000 AF. The 33,000 AF of intermittent water is the difference between 78,000 AF and 45,000 AF (total CVP supply).

The WFA's stated amount of intermittent supply for the County/SCWA is assumed in the WSMP to represent a long-term average rather than a maximum amount. In the wet/normal years, intermittent water supplies are used prior to CVP water supplies. The result is that Zone 40 maximizes intermittent supplies when available. The maximum amount of intermittent water in the wettest year is approximated to be 50,000 AF rather than 33,000 AF.

Portions of Zone 40 also lie within the American River Place of Use. The WFA assumes that the City of Sacramento's American River water entitlements are sufficient to meet all demands within the Place of Use. For conservative planning purposes of Zone 40 water facilities, areas within the Place of Use are served by conjunctive use water supplies using the contracts mentioned above. The County/SCWA will pursue working with the City in being able to divert and treat American River water from either of the Sacramento River diversion locations being considered in the WSMP. If obtained, the additional water will reduce the total conjunctive use water need.

SECTION 3 – SURFACE WATER SUPPLIES
SACRAMENTO COUNTY DEPARTMENT OF WATER RESOURCES
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UPSTREAM WATER TRANSFERS WILL BE PURSUED TO REDUCE RELIANCE ON INTERMITTENT SURFACE WATER.

Initial County/SCWA conjunctive use operations will utilize intermittent supplies first and then CVP entitlements. As demands approach build-out, other water transfers will be necessary in dry and critically dry years to comply with long term average operational groundwater yield limitations. Possible transfers include contracting with Browns Valley Irrigation District, Placer County Water Agency, Yuba County Water Agency and/or East Bay Municipal Utility District. Outright purchase of water rights from other water rights holders upstream of the City of Sacramento’s Sacramento River Water Treatment Plant (SRWTP) may also be possible. The use of water transfer water will not necessarily be to reduce reliance on intermittent surface water, rather, to increase the firm yield of surface water in dry and critically dry years.

THE PL 101-514 AND SMUD WATER WILL BE SUBJECT TO SHORTAGES IMPOSED ON ALL CVP M&I CONTRACTORS. INTERMITTENT SURFACE WATER IS AVAILABLE ONLY WHEN THE WATER IS SURPLUS TO THE NEEDS OF THE SAN JOAQUIN-SACRAMENTO RIVER AND DELTA.

The table below indicates the shortages assumed in the planning of Zone 40 surface water supplies. Intermittent water supplies are expressed in terms of estimated average and not total contract amount.

SECTION 3 – SURFACE WATER SUPPLIES
SACRAMENTO COUNTY DEPARTMENT OF WATER RESOURCES
TM 2 - ZONE 40 WATER FORUM RECONCILIATION

Table 3-1. Total Anticipated Surface Water Supplies

Surface Water Entitlements	Source	Entitlement Amount (AFA)	Dry Year Cutback ^{1,2} (%)	Dry Year Supply (AFA)
P.L. 101-514 (Fazio Water)	American River	15,000	25 %	11,250
SMUD Water Assignments	American River	30,000	25%	22,500
Intermittent Water ³	American River and Sacramento River	17,000 (estimated average)	100%	0
Additional Water Transfers	American River and Sacramento River	16,000	25%	12,000
Total Surface Water	American and Sacramento River	78,000		45,750

Notes:

1. Dry Year Cutback as a percentage of the total contract in dry years
2. The cutbacks of 25% and 100% may occur during the most severe dry year scenario. Meeting demands in such severe dry year conditions would be achieved through implementation of a water shortage contingency plan consisting of 5 incremental stages of increased conservation. Under these severe conditions a water use reduction of 28% would be needed.
3. Intermittent Water is obtained through an appropriate water right. The maximum contract amount is approximated at 50,000 AF.

ALL OF THE SURFACE WATER FOR THE COUNTY/SCWA IS ASSUMED TO BE DIVERTED AT OR NEAR THE MOUTH OF THE AMERICAN RIVER OR FROM THE SACRAMENTO RIVER.

All alternatives in the SCWA Zone 40 WSMP include diversion either at the mouth of the American River or further downstream on the Sacramento River near Freeport.

SECTION 3 – SURFACE WATER SUPPLIES
SACRAMENTO COUNTY DEPARTMENT OF WATER RESOURCES
TM 2 - ZONE 40 WATER FORUM RECONCILIATION

THE AMOUNT OF GROUNDWATER USED [BY THE SOUTH COUNTY M&I USERS GROUP] WILL VARY FROM APPROXIMATELY 95,100 AF IN THE DRIEST YEARS DECREASING TO APPROXIMATELY 34,000 AF IN THE WET YEARS.

The WFA statement assumes that in the critically dry years, the PL 101-514 and SMUD 1 CVP surface water contracts (30,000 AF) are in-place and subject to a 25% cut back to 22,500 AF and intermittent water is cutback 100%. The total demand for the South County M&I Users Group is stated as 117,600 AF. The difference between the demand and the amount of available surface water is assumed to be the total groundwater need. In the critically dry years, the maximum groundwater need is estimated to be 95,100 AF (117,600 AF–22,500 AF = 95,100 AF). In the wettest years, 83,600 AF of surface water is assumed to be the maximum available on the Sacramento River leaving a possible minimum groundwater need of 34,000 AF. The WFA’s use of the higher amount of 83,600 AF rather than the maximum of 78,000 AF is believed to be an artifact of the surface water modeling assuming maximum use of available Sacramento and American River water. Under the Zone 40 WSMP the minimum and maximum surface water availability is 45,750 AF and 78,000 AF, respectively. The maximum and minimum groundwater need is 71,850 AF and 39,600 AF, respectively. Both inside the range specified in the WFA.

SECTION 4 – PRINCIPAL FINDINGS
SACRAMENTO COUNTY DEPARTMENT OF WATER RESOURCES
TM 2 - ZONE 40 WATER FORUM RECONCILIATION

SECTION 4 - INVESTIGATION OBJECTIVES

This TM reconciles differences between the Zone 40 WSMP and the WFA. Three principal objectives of this TM include:

- Compare the WFA’s stated water need for County/SCWA and what is shown in the WSMP.
- Explain the development of County/SCWA’s total surface water requirements and any differences with the WFA.
- Describe the estimated groundwater use in the County/SCWA Zone 40 service area and any differences with the WFA.

SECTION 5 - PRINCIPAL FINDINGS

- 1. The Zone 40 WSMP has a conjunctive use water need of 108,664 AFA which closely approximates the 105,396 AFA water need based on Water Forum planning assumptions.**

As described in **Section 2**, the conjunctive use water needs analyses for the Zone 40 WSMP is independent of the assessment completed for the WFA. Varied assumptions exist between the two studies including (but not limited to): water demand factors, system losses, land uses, and areas to receive water beyond build-out of the General Plan Urban Policy Area. The difference of 3,268 AFA is not surprising and can be attributed to refined land use data in new growth areas where creation and adoption of community and specific plans have taken place.

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2. Surface water requirements in the Zone 40 WSMP are consistent with the WFA.

The maximum surface water need in any given hydrologic year type for Zone 40's conjunctive use area is 78,000 AFA. The total volumes of surface water either under contract or entitled by appropriative rights is 111,000 AFA. Of this, firm contract supplies total 61,000 AFA, and intermittent supplies total 50,000 AFA. As explained in **Section 3**, uses of intermittent supplies take first priority and are maximized in wet years. Depending on the available volume of intermittent supplies in a given year, firm contract supplies may only be partially used. The total volume in any given year does not exceed the 78,000 AFA.

3. Zone 40 groundwater extractions stay within the range specified in the WFA.

The WFA specifies a range of groundwater use for the South County M&I Users Group, that is an area larger than Zone 40 including areas within CUCC and EGWW. The Zone 40 WSMP takes a conservative approach to overall groundwater allocation within the South County M&I Users Group by assuming that areas not within Zone 40 continue to rely solely on groundwater for meeting their build-out water demand. The Zone 40 WSMP compensates for this assumption by increasing the total volume of firm surface water contracts (see **Table 3-1**, Additional Water Transfers). The result is a range of South County M&I Users Group groundwater extractions that fall within the range specified in the WFA.

APPENDIX D

Water Conservation BMPs



APPENDIX D

**WATER FORUM SACRAMENTO COUNTY/SCWA'S
WATER CONSERVATION PLAN**

COUNTY OF SACRAMENTO WATER FORUM WATER CONSERVATION PLAN

BMP 1 INTERIOR AND EXTERIOR WATER AUDITS AND INCENTIVE PROGRAMS FOR SINGLE FAMILY RESIDENTIAL, MULTI-FAMILY RESIDENTIAL, AND INSTITUTIONAL CUSTOMERS

- A. Within three years of agreement signing, the County of Sacramento will have:
 - 1. Trained water auditors on staff or available through cooperative agreements with other purveyors.
 - 2. Prepared and made available, as needed, multi-lingual interior and exterior water audit materials for customers.
 - 3. Prepared and made available to customers seasonal climate-appropriate irrigation information.
 - 4. Investigated opportunities for community based organizations (CBOs) to receive the training and financial incentives necessary for them to implement this BMP for their constituents.
- B. The County of Sacramento will annually:
 - 1. Actively market an interior and exterior, including landscape, water audit program which targets customers when they are most likely to be receptive to participation and which continues to target the top 20% water users.
 - a. During conversion to complete service area meter reading, offer water use reviews to all SF, MF and Institutional customers which receive a meter and continue to offer these reviews to customers whose meter readings indicate they are in the top 20% of water users.
 - 2. After complete service area meter reading, continue to actively market the water audit program to the top 20% of water users.
 - 3. 2. Offer, through bill inserts or other means, water-use reviews to all customers.
 - 4. 3. Survey past program participants to determine if audit recommendations were implemented.
- C. The water-use review program will:
 - 1. Provide audits conducted by trained auditors.
 - 2. Provide audits that may include device installation by the County of Sacramento or customer (showerheads, faucet aerators, etc.), identification of water-use problems, recommend repairs, instruction in landscape principles (hydrozones, ET, etc.), irrigation timer use and, when appropriate, meter reading.
 - 3. Provide program participants with seasonal irrigation schedules by hydrozone and/or station.
- D. The County of Sacramento will be fully implementing the program described above no later than the beginning of the fourth year after agreement signing.

BMP 2 PLUMBING RETROFIT OF EXISTING RESIDENTIAL ACCOUNTS

- A. Within three years of agreement signing, the County of Sacramento will:
 - 1. Have Sacramento Area Water Works Association (SAWWA) offer to all customers with home built between 1987 and 1992 retrofit kits that include high quality low-flow showerheads, faucet aerators and toilet leak detection tablets.
 - 2. Offer toilet leak test kits to all change of account customers who visit the signatory's office.
 - 3. Work with the local "Welcome Wagon" or equivalent organization to provide water conservation materials to new residents.
 - 4. Work with local hardware/home stores to offer free water conservation information and toilet leak test kits at the check-out counters.
 - 5. Investigate partnership programs with local energy utilities to provide water conservation audits, materials and devices.
- B. The County of Sacramento will be fully implementing the program described above no later than the beginning of the fourth year after agreement signing.

BMP 3 DISTRIBUTION SYSTEM WATER AUDITS, LEAK DETECTION AND REPAIR

- A. Within three years of agreement signing, the County of Sacramento will complete and maintain, in the unmetred areas:
 - 1. An annually updated “system map” of type, size and age of pipes; pressures; and leak history.
 - 2. Installation of devices (such as pressure recorders) or use of other methods designed to identify area with greater than 10% losses.
 - 3. An ongoing meter calibration and replacement program for all production and distribution meters.
 - 4. An ongoing leak detection and repair program (as defined in the manual) focused on high probability leak areas identified by the system map.
 - 5. A complete system-wide leak detection program repeated no less often than every ten years; unless there are special circumstances, such as age of system or planned main replacement.
- B. Within three years of agreement signing, the County of Sacramento will complete and maintain, in the metered areas:
 - 1. An annual system water audit, determining the difference between production and sales.
 - 2. An annually updated “system map” of: type, size and age of pipes; pressures; record of leaks, etc.; with historic data.
 - 3. An ongoing meter calibration and replacement program.
 - 4. An ongoing leak detection/repair program focused on high probability leak areas identified by map.
 - 5. A complete system wide leak detection program, repeated: when the system water audit determines losses to be greater than 10%; when the losses are less than 10% if the program is determined to be cost effective.
- C. The County of Sacramento will be fully implementing the program described above no later than the beginning of the fourth year after agreement signing.

BMP 4 NON-RESIDENTIAL METER RETROFIT

- A. Within three years of agreement signing, the County of Sacramento will:
 - 1. Identify all non-residential unmetred customers.
 - 2. Provisionally identify any non-residential unmetred customer accounts that may be very difficult and expensive to retrofit.
 - 3. Meter unmetred non-residential accounts so that within two years all are metered.
 - 4. Begin installation of meters at non-residential unmetred customer locations, with consideration of separate landscape meters.
- B. Within ten years of meter installation, the County of Sacramento will provide newly metered non-residential customers with:
 - 1. Information on how to read their meter and a consumption-based water bill.
 - 2. Information on the County-provided water conservation programs and services.
- C. The County of Sacramento will be fully implementing the program described above no later than the beginning of the fourth year after agreement signing.

BMP4 RESIDENTIAL METER RETROFIT

- A. The agreement related to the implementation of a residential meter retrofit program is described in the Water Forum Agreement, Section Three, V., 3., C., 1. b, page XXX.

BMP 5 LARGE LANDSCAPE WATER AUDITS AND INCENTIVES FOR COMMERCIAL, INDUSTRIAL, INSTITUTIONAL (CII), AND IRRIGATION ACCOUNTS

- A. Within three years of agreement signing, the County of Sacramento will:
 - 1. Identify all Irrigation accounts and CII accounts with landscapes of one acre and larger and record that information in the customer database.
 - 2. Have certified and/or trained landscape water auditors on staff or available through agreements.

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SACRAMENTO COUNTY WATER AGENCY
ZONE 40 WATER SUPPLY MASTER PLAN

3. Prepare and distribute multi-lingual (as appropriate) irrigation system materials, seasonal climate-appropriate information on irrigation scheduling and offer training for customers/landscape workers.
 4. Develop seasonal climate-appropriate information to determine irrigation schedules, for the three basic hydrozones identified in the California Department of Water Resources (DWR) Landscape Water Management Handbook, and provided that information to the customers with one acre or larger landscapes.
 5. Begin installation of climate appropriate water efficient landscaping at landscaped the County of Sacramento facilities, phased in over the five years following agreement signing.
- B. The County of Sacramento will annually:
1. Directly contact all Irrigation accounts and CII accounts with one acre and larger landscapes, not previously audited, and offer them landscape water-use reviews (audits).
 2. Offer, through bill inserts or other means, landscape water-use reviews to all customers.
 3. Survey past program participants to determine if audit recommendations were implemented.
 4. Offer program participants with separate irrigation meters information showing the relationship between actual consumption and their ET-based water demand.
- C. The County of Sacramento's landscape water-use review program will:
1. Provide audits conducted by certified landscape water auditors.
 2. Provide audits that consist of a system review, to identify necessary irrigation system repairs, and, once repairs have been completed, a water-use review including measurement of landscaped area.
 3. Provide program participants with seasonal irrigation schedules by hydrozone and/or station.
 4. Provide program participants with regular reminders to adjust irrigation timer settings.
 5. Provide incentives to achieve at least 12% annual participation of targeted customers.
- D. The County of Sacramento will be fully implementing the program described above no later than the beginning of the fourth year after agreement signing.

BMP 6 LANDSCAPE WATER CONSERVATION REQUIREMENTS FOR NEW AND EXISTING COMMERCIAL, INDUSTRIAL, INSTITUTIONAL AND MULTIFAMILY DEVELOPMENTS

- A. The County of Sacramento will enact and implement a landscape water efficiency ordinance pursuant to the "Water Conservation in Landscaping Act" (California Code of Regulations, Chapter 2.7), that is at least as effective as the Model Water Efficient Landscape Ordinance described in Chapter 2.7, Sections 490-495. The County of Sacramento will:
1. Participate in and support a regional landscape task force established by the Forum Successor Effort. The Taskforce will include other local governments and water purveyors, the building and green industries and environmental / public interest groups. It will review the existing local ordinances to determine if it is at least as effective as the Model Water Efficient Landscape Ordinance. The Taskforce may suggest revisions to the existing landscape ordinances.
 2. As part of the Taskforce, participate in a review of the implementation of the local ordinances, including builder compliance, landscape plan review, final inspection/certification process and actual water use to determine their effectiveness.
 3. As part of the Taskforce, determine if program effectiveness is diminished by city/county staff time constraints, budget or lack of landscape knowledge/expertise, and, if so, recommend and support corrective action.
- B. The County of Sacramento will be fully implementing the program described above no later than the beginning of the fourth year after agreement signing.

BMP 7 PUBLIC INFORMATION

- A. Within three years of agreement signing, the County of Sacramento program will include: A combination of a County specific program in conjunction with full participation by the County in the SAWWA Conservation Committee's Public Outreach Program or other equivalent regional program. This

program includes programs such as: media advertising campaigns, commercial consumer outreach, promotional materials, community events and fairs, evapotranspiration data availability, a Web site, and allied organizations outreach.

- B. Elements implemented directly by the County of Sacramento will include:
1. Using utility bill inserts or messages on payment notices.
 2. Providing information on residential metered customers' bills showing use in gallons per day for the last billing period compared to the same period the year before.

BMP 8 SCHOOL EDUCATION

A. Within three years of agreement signing, the County of Sacramento program will include: A combination of a County specific program in conjunction with full participation by the County in the SAWWA Conservation Committee's Public Outreach Program or other equivalent regional program. This program includes programs such as: school outreach, promotional materials, community events and fairs, and a Web site.

- B. Elements implemented directly by the County of Sacramento include:
1. Offering tours of County facilities to elementary schools in the County's service area.
 2. Working with schools served by the County to promote school audits, reduced water bills, and innovative funding for equipment upgrades.

BMP 9 COMMERCIAL AND INDUSTRIAL (CI) WATER CONSERVATION

- A. Within three years of agreement signing, the County of Sacramento will have:
1. Trained commercial/industrial water auditors on staff or available through cooperative agreements.
 2. The DWR Commercial / Industrial (CI) water-use materials available for CI customers.
 3. Established, if possible, cooperative CI audit programs with other utilities.
 4. A list of available CI water-use consultants.
- B. The County of Sacramento or their representative will annually:
1. Identify the top 10% of commercial water users and top 10% of industrial water users, not previously audited, and directly contact them or the appropriate customer's representative and offer them water-use reviews (audits). Provide these customers with data on their current water-related costs (supply, wastewater, energy, on-site treatment, etc.).
 - a. (For metered customers) annually determine the top 10% of commercial customers and of industrial customers based on water use, and when appropriate, special water use factors (high water use, high wastewater flows, poor quality wastewater, high energy use, etc.).
 - b. (For unmetered customers) annually determine the top 10% of commercial customers and of industrial customers based on special water-use factors such as wastewater flows, poor quality wastewater, or high-energy use, etc.
 2. Offer, through bill inserts or other means, CI water-use reviews to all CI customers.
 3. Survey past program participants to determine if audit recommendations were implemented.
- C. The County of Sacramento's water-use review program will:
1. Provide audits conducted by trained commercial/industrial water auditors.
 2. Provide incentives to achieve at least 20% annual participation of the targeted 10% of customers.
 3. Contact past program participants for a follow-up audit at least every fifth year.
- D. The County of Sacramento will establish policies requiring water intensive commercial and industrial building permit applicants (new, modified or change-of-water-use) to conduct a water-use efficiency review and submit the findings in required environmental documentation for the commercial or industrial project.
- E. Within three years of agreement signing, the County of Sacramento will:
1. Promote the use of efficient water-use technologies by commercial and industrial customers by offering incentives related to the benefits gained by the water and sewer service providers.

2. Consider separate landscape water meter(s) when combined service would require a 1½" meter.
 3. Require efficient cooling systems, recirculating pumps for fountains and ponds, and water recycling systems for vehicle washing as a condition of service.
- F. The County of Sacramento will be fully implementing the program described above no later than the beginning of the fourth year after agreement signing.

BMP 11 CONSERVATION PRICING FOR METERED ACCOUNTS

- A. Within three years of agreement signing, the County of Sacramento will:
1. Identify all metered customers by account type (single family, multi-residential, commercial, industrial, institutional, landscape irrigation, reclaimed, wholesale).
 2. Establish quantity-based rates for each account type.
 3. Begin educating all customers about the quantity-based rate structure.
 4. Provide metered customers with monthly or bi-monthly information which shows current flat-rate charges, actual water use in gallons, and what charges would have been if based on actual use.
- B. The County of Sacramento will, within ten years of agreement signing, bill all metered customers utilizing rates designed to recover the cost of providing service as well as on quantity of water used.

BMP 12 LANDSCAPE WATER CONSERVATION FOR NEW/EXISTING SINGLE FAMILY HOMES

- A. The County of Sacramento will implement a program that includes:
1. Information on climate-appropriate landscape design, plants and efficient irrigation equipment/management provided to change-of-customer accounts and, in cooperation with the Building Industry Association of Superior California, to new customers. The availability of this information will be publicized to all existing Single Family Homes in the County of Sacramento's service area on an annual basis.
 2. Landscape audit program offered to all SF and MF accounts that receive a meter or interior audit. and
 3. Annual pre-irrigation season notification to Single Family Homes served by the County of Sacramento of the County of Sacramento-provided landscape assistance.
- B. The County of Sacramento's ongoing program, in cooperation with the California Landscape Contractors Association, Sacramento Area Water Works Association, other purveyors, etc., will include:
1. Participation in the development/maintenance of a local demonstration garden within five years following agreement signing (does not have to be located within the County of Sacramento's service area but should be convenient to the County of Sacramento's customers).
 2. Annual participation at local and regional landscape fairs and garden shows.
 3. Annual cooperative education and marketing campaigns with local nurseries.
 4. Annual irrigation season landscape media campaign.
 5. Annual post-irrigation season notification, to all customers, of the importance of timer resets/ sprinkler shut-offs.
- C. The County of Sacramento will:
1. Participate in and support a regional landscape task force established by the Forum Successor Effort. The Taskforce will include other local governments and water purveyors, the building and green industries and environmental / public interest groups. It will review the existing local ordinances to determine if it is at least as effective as the Model Water Efficient Landscape Ordinance. The Taskforce may suggest revisions to the existing landscape ordinances.
 2. As part of the Taskforce, participate in a review of the implementation of the local ordinances, including builder compliance, landscape plan review, final inspection/certification process and actual water use to determine their effectiveness.
 3. As part of the Taskforce, determine if program effectiveness is diminished by city/county staff time constraints, budget or lack of landscape knowledge/expertise, and, if so,

County of Sacramento will be fully implementing the program described above no later than the beginning of the fourth year after agreement signing.

BMP 13 WATER WASTE PROHIBITION

Within three years of agreement signing, the County of Sacramento will enact a water waste prohibition ordinance that includes measures and enforcement mechanisms.

- A. The water waste prohibition measures will include:
 - 1. Irrigation water shall not be allowed to run off to adjoining property or to a roadside ditch or gutter.
 - 2. Leaking pipes, fixtures, or sprinklers shall be repaired promptly.
 - 3. Open hoses not permitted - automatic shut-off nozzles are required. and
 - 4. Swimming pools, ponds and fountains shall be equipped with recirculating pumps. Pool draining and refilling only for health, maintenance or structural reasons - requires agency approval.
- B. Other measures, such as the following, may be permanent, seasonal or related to water shortage:
 - 1. Restricting irrigation hours or days.
 - 2. Use of a hose to clean sidewalks, driveways, patios, streets and commercial parking lots is not permitted, except for health and safety.
 - 3. Restaurants serving water only on request.
 - 4. Restricting the use of potable water for compaction, dust control or other construction purposes when non-potable water is available. and
 - 5. Limiting the flushing of sewers or fire hydrants, except for health and safety (may be permanent, seasonal or related to water shortage).
- C. The waste prohibitions will include as enforcement mechanisms a graduated series of responses to water wasting customers. Enforcement typically includes: personal notification and an offer of a water-use review / repair service, monetary fees, service termination and, in some un-metered service areas, and mandatory water meter installation / reading.
- D. Within three years of agreement signing the County of Sacramento will:
 - 1. Notify all customers at least annually of the waste prohibitions (by newspaper, public notice, mailings, utility billings or a combination of such) prior to the irrigation season.
 - 2. Have staff will respond to reports of water waste in a timely manner.
 - 3. Will have water waste patrols at least during water shortages.
 - 4. Will cooperate with the city or county in their program enforcement efforts.

BMP 14 WATER CONSERVATION COORDINATOR

The County of Sacramento's water conservation coordinator is XXXXXXXXX and she/he is responsible for preparing, implementing and monitoring the Plan.

Within three years of agreement signing, at least one staff member at the County of Sacramento will be an AWWA Certified Water Conservation Practitioner (Level II) or pass equivalent training.

BMP 16 ULTRA-LOW FLUSH TOILET REPLACEMENT PROGRAM FOR NONRESIDENTIAL CUSTOMERS

- A. Within three years of agreement signing, the County of Sacramento will:
 - 1. Identify all non-residential customers, estimate the approximate number of non-ULF toilets at each account, and rank them by high, medium or low use (e.g., restaurant toilets are high use, warehouse toilets are low use).
 - 2. If possible, established a cooperative district / sanitation district ULF rebate program.
- B. The County of Sacramento will annually:
 - 1. Offer, through direct mail or other direct communication, ULF rebates to all nonresidential accounts, which do not yet have ULF toilets, with special focus on those with the highest number of high-use non ULF-toilets.
- C. The retrofit program will:
 - 1. Offer the necessary incentive (which may include rebates, no interest loans, vouchers, billing surcharges/rebates, etc.) to insure that at least 10% of non-residential non-ULF toilets are replaced with ULF toilets each year, with a final installation target of 90% of all non-residential toilets being ULFs within ten years.

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2. Consider larger rebates for the more expensive high-use flushometer-type ULF installations.
 3. Investigate opportunities for CBOs to receive the training and financial incentives necessary for them to implement this BMP for their constituents. and
 4. Consider monitoring the change in water use at metered-accounts that install ULF toilets.
- D. The County of Sacramento will be fully implementing the program described above no later than the beginning of the fourth year after agreement signing.

CITIZEN INVOLVEMENT PROGRAM

County will invite the existing Community Planning Advisory Committees to designate a representative(s) to provide input to the proposed residential metering implementation plan. It is intended that this informal group will serve to provide valuable citizens' input on the overall approach to implementation of residential metering.

APPENDIX E

Operational Parameters



APPENDIX E
OPERATIONAL PARAMETERS – ZONE 40
CONJUNCTIVE USE PROGRAM

Conjunctive Water Management Operations Model

A computer operations model was developed for Zone 40 that compares available water supplies with system demand on an hourly basis. In making this comparison, the model prioritizes the use of surface water supplies based on availability of supply and capacity of facilities. Each source of surface water is given a priority. After those sources have been fully utilized, the model then uses groundwater to meet demands. Storage provides for peak hour demands. Model runs were made for each of the critical demand periods in conjunction with the phasing of surface water facilities. For each demand period, the model simulates the system based on 70 years of historical hydrology keeping the demands, facilities, and supply conditions constant. The model assumes that the water distribution system capacity is sufficient to convey available surface water to the demand. Model results are expressed in terms of average, maximum, and minimum groundwater use for the level of surface water capacity in place.

Surface Water Facility Assumptions

For the purpose of this analysis, it is assumed that SCWA will construct the surface water facilities described in Alternative 2 – Freeport Regional Diversion Project as presented in **Table 6-5** of the master plan report. The phasing of surface water facilities will occur so as not to exceed the Water Forum sustainable groundwater yield.

Surface water treatment and delivery to Zone 40 includes 11 million gallons per day (mgd) of City of Sacramento Water Treatment Plant (WTP) capacity (non-dedicated) and the Central WTP. The design and operation of the Central WTP is assumed to minimize the impact of scheduled maintenance and higher turbidity in the raw water supply during wet months of the wet years on treatment plant output. Issues related to flow reversal in the Sacramento River will be addressed in the engineering of the Freeport project.

Groundwater Facility Assumptions

Groundwater extraction capacity is sized to meet a certain level of redundancy during maximum day demands in the event that little or no surface water is available in dry and critical years. While the computer model is capable of modeling recharge facilities, no injection or storage component is used in this analysis.

Surface Water Supply Assumptions

The timing and amount of surface water available from each source is based on estimates of their reliable yield. CVP sources are assumed to be on a deficiency pattern that is based on hydrologic year type. Much of the information related to surface water availability was taken from the latest CALSIM runs as described below. Availability of excess flows under SCWA's water right application is based on several criteria as discussed below. Water right transfers are considered to be the most reliable of supplies but will likely cost more than other supplies and are subject to other types of conditions. The priority of use of water supplies in the model are such that excess flows are used first, CVP supplies second, and water right transfers last.

Projected Availability of Excess Flows

The occurrence of Delta outflow in excess of regulatory requirements in the future is uncertain. Delta outflow depends on water demand growth, the degree to which additional storage is constructed in California, and future regulatory requirements. Computer modeling has been performed under the CALFED Bay-Delta Program to simulate future water supply conditions and estimate future Delta outflow. The use of excess flows may be limited by conditions similar to those contained in Water Right Standard Permit Term 91¹.

¹ Term 91 Inbasin Entitlements Delta and Tributary Rivers

No diversion is authorized by this license when satisfaction of inbasin entitlements requires release of supplemental Project water by the Central Valley Project or the State Water Project.

- A. Inbasin entitlements are defined as all rights to divert water from streams tributary to the Sacramento-San Joaquin Delta or the Delta for use within the respective basins of origin or the Legal Delta, unavoidable natural requirements for riparian habitat and conveyance losses, and flows required by the State Water Resources Control Board (SWRCB) for maintenance of water quality and fish and wildlife. Export diversions and Project carriage water are specifically excluded from the definition of inbasin entitlements.
- B. Supplemental Project water is defined as water imported to the basin by the projects, and water released from Project storage, which is in excess of export diversions, Project carriage water, and Project inbasin deliveries.

The SWRCB shall notify the licensee of curtailment of diversion under this term after it finds that supplemental Project water has been released or will be released. The SWRCB will advise the licensee of the probability of imminent curtailment of diversion as far in advance as practicable based on anticipated requirements for supplemental Project water provided by the Project operators.

Various computer models have been developed to simulate the operations of the State Water Project (“SWP”) and CVP; they are PROSIM, DWRSIM and CALSIM. PROSIM, developed by the USBR, simulates the CVP operations in detail and contains simplified SWP operations. DWRSIM, developed by California Department of Water Resources (“DWR”), contains detailed SWP operations and simplified CVP operations. CALSIM, however, developed through a collaborative effort of DWR and USBR, simulates both SWP and CVP operations.

No Delta outflow can be diverted when Term 91 is in effect. The result of a CALSIM Benchmark Study (G Model, 2020 level of demand) dated September 30, 2002 is used to evaluate the availability of excess Delta outflow. Post-processing of CALSIM output is necessary to obtain this value.

Three criteria are applied to determine the availability of monthly excess Delta outflow. If any one criterion is satisfied, no excess Delta outflow can be diverted during that month. These criteria are:

1. Excess Delta outflow below minimum Delta outflow requirements to protect the estuarine habitat for anadromous fishes and other estuarine-dependent species. The 1995 Bay-Delta Plan sets the minimum monthly Delta Outflow rate for each Sacramento Valley water year type.
2. Export inflow ratio is above maximum allowable limit necessary to protect the habitat of estuarine-dependent species by reducing the entrainment of various life stages by the major export pumps in the southern Delta. This is the combined project export rate in terms of the percentage of the Delta inflow in the 1995 Bay-Delta Plan.
3. CVP/SWP storage withdrawals are occurring for in-basin uses. CVP storage includes Folsom Lake, Lake Shasta, Keswick Reservoir, Whiskeytown Lake, and imports from Trinity Lake. SWP storage includes Lake Oroville. When the total CVP/SWP storage is decreasing, excess water is unavailable because supplemental Project water is being released.

Figure E-2 shows the projected occurrence and average volume of excess Delta outflow based on the most current modeling using CALSIM. The majority of available water occurs in the months of January through March when water is in excess to the Delta and the State and Federal water projects. **Figure E-3** illustrates the availability of supplies over the 73 years of historical hydrology used in the CALSIM model runs. Each line on the graph is a month when excess flows may be diverted by SCWA.

Figure E-2. Predicted Average Delta Excess Under Term 91 Conditions

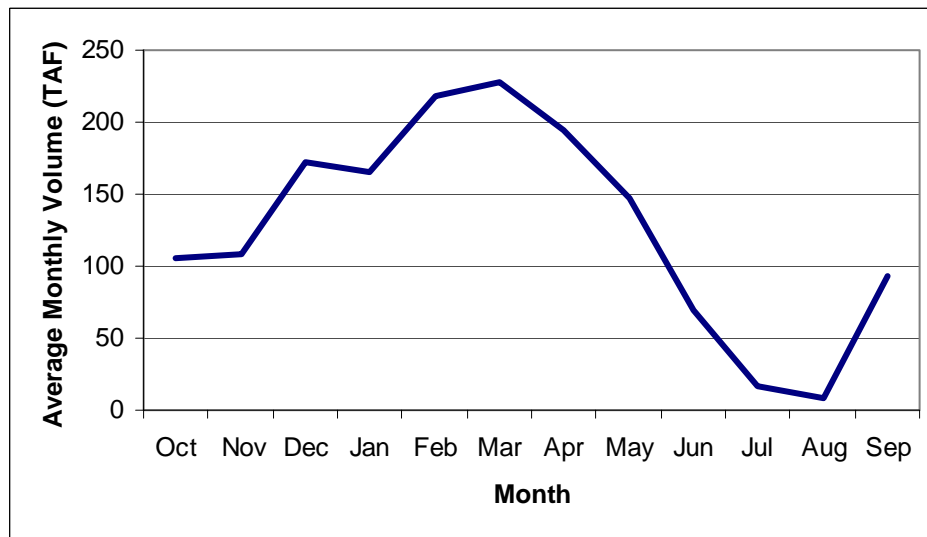
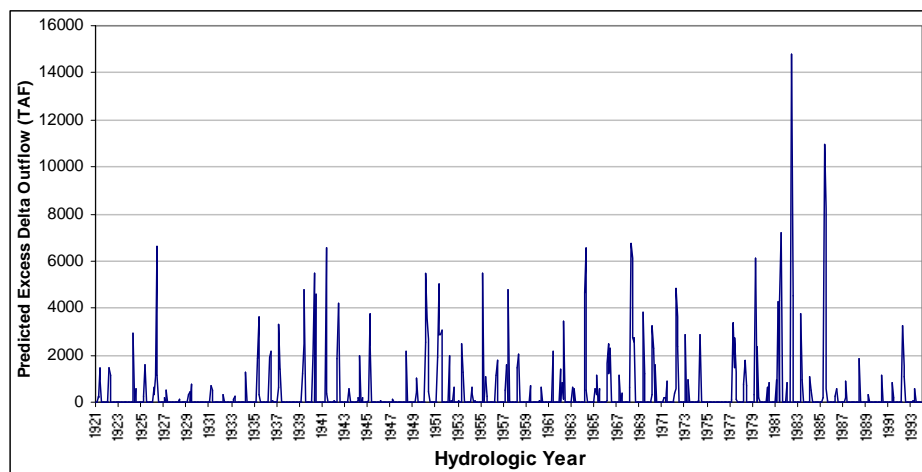


Figure E-3. Monthly Availability of Section 11460 Water over 73 Hydrologic Years



Groundwater Yield

The sustainable yield of the groundwater basin is stated in the Water Forum Agreement and discussed in **Section 3**. It is assumed that SCWA has access to 40,900 AF/year annually of groundwater that can be either used directly to meet water demands or, if surface water is available, the groundwater can be “banked” as in-lieu storage. The sustainable yield objectives of the groundwater basin are met when the average long term yield over the 70-year hydrologic period does not exceed the 40,900 AF/year.

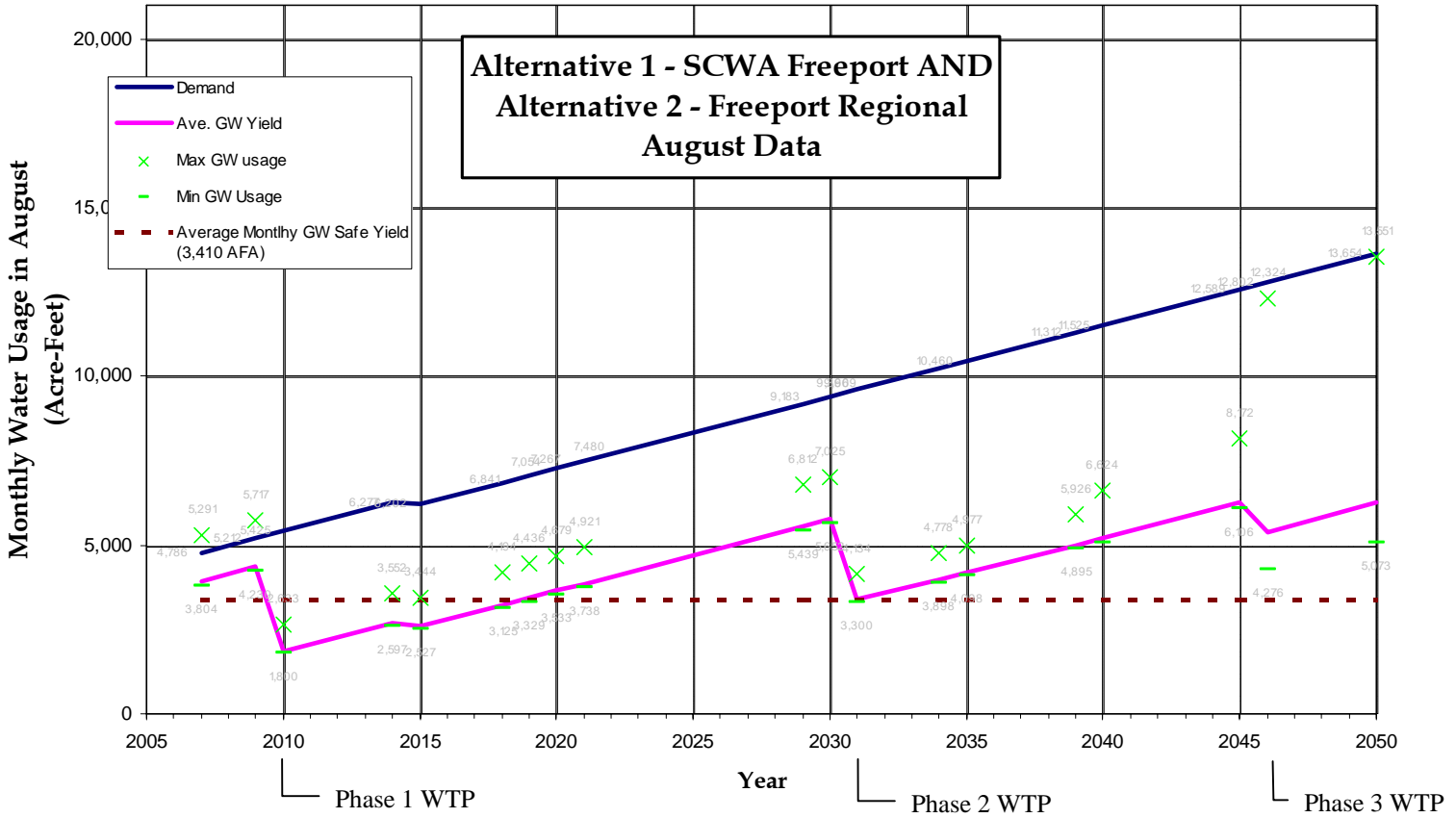
Operations Model Findings

The size of surface water and groundwater facilities for the capital program have been optimized to make optimal use of available wet year water. Surface water facility capacity could be increased in size to use more of the available wet year water. However, there is a point at which the full capacity of the treatment plant and conveyance system would only be used during peak months of extremely wet years (i.e., when surface water is available in sufficient quantity). This study limited treatment plant capacity by comparing the water treatment plant capacity with the average use of the treatment plant capacity over the 70-year hydrologic period. If the average use became less than 50 percent of the total water treatment plant capacity, no additional capacity was assumed and other sources of water supply were sought.

Figure E-4 provides a summary of model results for the planning period for the month of August. August provides the worst case scenario for purposes of phasing the different water supply elements. The three curves-lines on the figure represent (from top to bottom) the water demand, the sustainable groundwater yield objective, and the average use of groundwater. The demand line begins with historical demands from 1995 to 1999 and, beginning in 2000, demands are projected linearly to 2050 based on **Table 2-1** and **Table 2-2**. Steps in the demand curve occur when portions of the demand are taken over with recycled water.

The dashed line represents Zone 40’s sustainable groundwater yield objective of 40,900 AF/year. The bottom line represents the average use of groundwater over the 70-year hydrologic period based on the availability of surface water over time. This line presents the timing of needed surface water projects and does this by not exceeding the groundwater yield. The maximum and minimum points at every facility phase reflect the dry year and wet year events when groundwater capacity is at its highest and lowest points, respectively.

Figure E-4. Facility Phasing Diagram



APPENDIX F

Surface Water Quality



APPENDIX F
SURFACE WATER QUALITY CONSTITUENTS AND
TREATMENT TECHNOLOGIES

The selection of the appropriate treatment process for Sacramento River water diverted at the Freeport intake site (as at the SRWTP site) depends on general water quality factors such as turbidity, color, total organic carbon (TOC), bacteriological contamination, and other upstream contamination. Below is a brief discussion of the water quality constituents evaluated.

Coliform:

- The total coliform values are below 1,000 MPN/100 mL at Freeport and the City of West Sacramento's Bryte Bend Water Treatment Plant ("BBWTP") for 9 months out of the year. The total coliform value is below 1,000 MPN/100 mL at the City of Sacramento's Sacramento River Water Treatment Plant ("SRWTP") for 4 months out of the year.
- The fecal coliform and *E. Coli* levels are significantly lower than the total coliform levels at each monitoring site, and are relatively similar between monitoring sites.
- There are elevated levels of coliform in the Sacramento River during the winter months.

Giardia/Cryptosporidium:

- Based on samples collected to date, there is not a high concentration of *Giardia* or *Cryptosporidium* in the Sacramento River during any particular season. The moderate frequency of presumed detections and the infrequency of confirmed detections, at very low levels, indicate that the presence of these protozoa is probably low.

Turbidity:

- The average raw water turbidity level at BBWTP is 34 nephelometric turbidity unit(NTU). The average raw water turbidity level at SRWTP is 12 NTU. The turbidity levels at SRWTP are generally lower than BBWTP due to the influence of the American River.
- The water at the Freeport Regional Diversion site will likely be a blend of the two sources.

- Both WTPs are capable of achieving 99% removal of solids with conventional filtration processes.

Disinfection By-Product Precursors:

- Raw water TOC levels at the BBWTP have an average value of 2 parts per million (“ppm”). Raw water TOC levels at the SRWTP have a running annual average of less than 2.0 milligrams per liter (mg/L). Neither City will be required to implement enhanced coagulation based on either distribution system total TTHM and HAA5 levels or raw or treated water TOC levels.
- Raw water TOC levels at Freeport are slightly higher than upstream, based on very limited data, and enhanced coagulation may be required.
- TOC levels are greatest during the fall and winter months.

Molinate and Thiobencarb:

- Molinate and thiobencarb are detected at low levels during the spring months on the Sacramento River.
- There has been an increased number of positive detections in the raw water of both molinate and thiobencarb along the Sacramento River over the past five years.
- Molinate and thiobencarb concentrations are well below primary drinking water standards, but thiobencarb concentrations are sometimes detected in the raw water at levels that can result in taste problems in the treated water.

Overview:

- Based on the evaluation of water quality data available at Freeport, it appears that treatment requirements for this source water would be 2-log reduction of *Cryptosporidium*, 3-log reduction of *Giardia*, and 4-log reduction of viruses. The overall water quality appears good and similar in nature to the raw water at the BBWTP and the SRWTP.
- It is recommended that additional raw water quality data be collected from the potential Freeport Regional Diversion site to confirm treatment requirements as follows:

- Monthly *Giardia*, *Cryptosporidium* and *E.Coli*,
- Monthly TOC,
- Monthly or more frequent turbidity, and
- Molinate and thiobencarb through the Department of Pesticide Regulation (DPR) Rice Pesticide Program.
- Sampling at Freeport should be coordinated with sampling events for *Giardia* and *Cryptosporidium* by the Regional Plant to increase the frequency of sample collection.
- It may also be advantageous to perform bench or pilot testing to review the TOC removal capabilities of the source water and alternative treatment processes.

General guidelines have been established in the industry for applicability of basic treatment process alternatives of conventional treatment, direct filtration, in-line filtration, two-stage filtration, and membrane filtration based on basic water quality parameters. **Table F-1** presents these guidelines. Other criteria such as reliability, flexibility, ease of implementation, level of operator expertise, and waste solids handling also enter into the evaluation process.

Table F-1. Treatment Process Capabilities for Raw Water Quality

Quality Parameter	Conventional Treatment	Direct Filtration	In-Line Filtration	Two-Stage Filtration	Membrane Filtration
Turbidity (NTU)	<1,000	<15	<2	<30	<100
Color (CU)	<100	<20	<5	<40	<20
Total Coliforms (MPN/100 ml)	<10 ⁵	<10 ³	<10 ²	<10 ⁴	<10 ⁵
Taste and Odor (TON)	<20	<5	<3	<10	<5
Algae (cells/mL)	<10 ³	<10 ²	<10	<5 x 10 ²	<10 ²
Total Organic Carbon (mg/L)	<10	<5	<2	<5	<5

As discussed earlier, the overall quality of the Sacramento River at Freeport is relatively high. However, the raw water quality is generally not applicable for direct filtration, in-line filtration, two-stage filtration and membrane filtration; turbidity episodes in excess of 200 NTU can occur on the Sacramento River. As demonstrated by the performance of the existing SRWTP under such conditions, the conventional process train has no difficulty in treating such water if adequate chemical feed, flocculation, and sedimentation time is provided. A second disadvantage for membrane filtration is the lack of operating facilities in the size range needed to treat the water diverted at the Freeport intake site. Due to the seasonal and sporadic nature of the raw water quality, and due to the experience limitation with membrane filtration, it is recommended that conventional treatment be utilized for water diverted at the Freeport intake site.

Water Facility Components



APPENDIX G
WATER FACILITY COMPONENTS AND
UNIT COSTS

COMPONENT:	GROUNDWATER FACILITIES
<u>COMPONENT SUMMARY</u>	
Corresp. Supply Component:	Groundwater Component
Required Facilities:	Wells, Treatment, Storage (Storage & Pumping), Emergency Power, Conveyance
Capacities Evaluated:	10 mgd (maximum day)
Capital Costs (\$ Million):	\$15.0 - \$17.0
<small>2002 Dollars ENR/CCI 7069</small>	

COMPONENT DESCRIPTION

General Description of Facilities

The facilities necessary for providing groundwater production capacity include wells, treatment, storage (storage and pumping), emergency power, and conveyance to the distribution system. It is assumed that most treatment facilities will have a maximum day input capacity of approximately 10 mgd per facility (i.e., six wells with 1,500 gpm capacity operating 75-percent of the time. At the larger facilities, an additional well will be provided for redundancy.

Participating/Coordinating Agencies

The installation of new wells, treatment and conveyance facilities within the 2030 study area of Zone 40 will not require participation or coordination with outside agencies. Installation of wells outside the 2030 study area of Zone 40 will require coordination to minimize interference with existing wells.

Needed Environmental Documentation

Compliance with California Environmental Quality Act (CEQA) will likely be required for the construction of conveyance and treatment facilities. It is not anticipated that any additional environmental documentation will be required unless the facilities are placed in environmentally sensitive areas such as streambeds or wetlands. The crossing of a streambed with conveyance facilities will require a Streambed Alteration permit from the California Department of Fish and Game and perhaps a 404 permit from the U.S. Army Corps of Engineers.

Institutional/Environmental Constraints

There are no other readily identifiable institutional or environmental constraints associated with this project that cannot be readily mitigated.

Useful Life

It is anticipated that the wells will have a useful life of approximately 30 years. The treatment and conveyance facilities will have a useful life of approximately 40 years.

Costs

The cost of facilities required for a 10 mgd groundwater production and treatment are detailed below. Costs have been developed for treatment of iron and manganese. Because well production and storage capacity varies depending on its location relative to surface water supplies, costs are estimated to range from \$16.0M to \$18.0M.

Facility	Costs (10 mgd: Iron, Mang.) (\$ Million)
Wells ⁽¹⁾ (\$600,000/well)	4.2
Treatment ⁽²⁾	6.5
Conveyance ⁽³⁾	1.0
Subtotal	11.7
Engr., Admin., & Cont. (35%)	3.9
Total	\$15.6

2002 Dollars ENR/CCI 7069

Notes:

- (1) Well costs based on 7 wells (18 inch-diameter, 1000 feet deep) with casing and pumps.
- (2) Treatment facilities costs based on treatment, treated water reservoir (3.5 million gallons), treated water pump station, and land (6 acres).
- (3) Conveyance includes pipeline from wells to treatment plant (5000 feet, 12 inch-diameter) and conveyance from treatment plant to distribution system (200 feet, 30 inch-diameter)

COMPONENT:	SCWA FREEPORT WATER TREATMENT PLANT
<u>COMPONENT SUMMARY</u>	
Corresp. Supply Components:	Appropriative Water SMUD 1 Assignment SMUD 2 Assignment "Fazio" Water (PL-101-514) Other Transfer Water Supplies Wholesale Water Agreement(s) with City to serve portion of Zone 40 in City's American River POU
Required Facilities:	Conventional treatment plant w/ intake structure and conveyance piping
Capacities Evaluated:	85 mgd
Capital Costs (\$ Million):	\$257.0
<small>2002 Dollars ENR/CCI 7069</small>	

ELEMENT DESCRIPTION

General Description of Facilities

This alternative consists of the construction of a diversion structure on the Sacramento River near the community of Freeport. Other facilities include: raw water conveyance pipeline from the diversion structure to the treatment plant, an 85 mgd (ultimate capacity) surface water treatment facility to be located on or near the Sacramento Regional County Sanitation District's wastewater treatment plant's "buffer lands." This component includes the existing 6 mgd (expandable to 11 mgd) of non-dedicated capacity at the City's SRWTP. This alternative also includes appurtenant treated water conveyance facilities.

Participating/Coordinating Agencies

The construction of this treatment plant and diversion facilities will require coordination with Sacramento Regional County Sanitation District (SRCSD) and the City of Sacramento.

Needed Environmental Documentation

Compliance with CEQA will be required for the construction of the conveyance and treatment facilities. In addition, an EIS will likely be required for the diversion from the Sacramento River to comply with National Environmental Policy Act (NEPA). The diversion structure in the Sacramento River and the crossing of a streambed with conveyance facilities will require a Streambed Alteration permit from the California Department of Fish and Game and a 404 permit from the U.S. Army Corps of Engineers.

Institutional/Environmental Constraints

Based on Federal Emergency Management Agency (FEMA) data, the Sacramento Regional County Sanitation District site is protected by levees from the 100-year flood. However, failure of the levee system would result in inundation of the site by approximately 13 feet of water during a 100-year flood event. Studies are presently underway by local and federal agencies aimed at providing improved flood protection for this and other areas of the Sacramento region.

A concern with the diversion location is the possibility of flow reversals in the Sacramento River caused by the combination of low river flows and tidal effects in the Delta. Flow reversals increase the possibility of treated wastewater effluent moving upstream to the Freeport diversion structure. Studies are currently being conducted to evaluate the effect of flow reversals on the location of the Freeport diversion structure. Findings may indicate the need to stop diversions during flow reversal events.

Useful Life

It is anticipated that the water treatment plant and all associated facilities would have a minimum useful life of 40 years. The plant could be built in phases such that additional capacity could be added, as needed. However, the quantity of land and sizing of the diversion structures should be based on the ultimate size of the treatment plant.

Cost

The estimated cost for the 85 mgd SCWA Freeport WTP including the diversion structure and raw water conveyance is based on recent feasibility and preliminary design studies completed for the Freeport Regional Water Project. The estimated cost is \$257M (includes admin, engineering, and contingency).

COMPONENT:	FREEPORT REGIONAL WATER PROJECT
<u>COMPONENT SUMMARY</u>	
Corresp. Supply Components:	Appropriative Water SMUD 1 Assignment SMUD 2 Assignment "Fazio" Water (PL-101-514) Other Transfer Water Supplies Wholesale Water Agreement(s) with City to serve portion of Zone 40 in City's American River POU
Required Facilities:	Conventional treatment plant w/ intake structure and conveyance pipeling
Capacities Evaluated:	85 mgd
Capital Costs (\$ Million):	\$280.0
<small>2002 Dollars ENR/CCI 7069</small>	

ELEMENT DESCRIPTION

General Description of Facilities

This alternative consists of SCWA and East Bay Municipal Utility District (EBMUD) constructing a diversion structure on the Sacramento River near the community of Freeport. Other facilities include: a joint SCWA/ EBMUD raw water conveyance pipeline to the central portion of Zone 40, a SCWA 85 mgd (ultimate capacity) surface water treatment facility in the central portion of Zone 40. This component includes the existing 6 mgd (expandable to 11 mgd) of non-dedicated capacity at the City's SRWTP. This alternative also includes appurtenant treated water conveyance facilities.

Participating/Coordinating Agencies

The construction of this treatment plant and diversion facilities will require coordination with SRCSD and the City of Sacramento.

Needed Environmental Documentation

Compliance with CEQA will be required for the construction of the conveyance and treatment facilities. In addition, an EIS will likely be required for the diversion from the Sacramento River to comply with NEPA. The diversion structure in the Sacramento River and the crossing of a streambed with conveyance facilities will require a Streambed Alteration permit from the California Department of Fish and Game and a 404 permit from the U.S. Army Corps of Engineers.

Institutional/Environmental Constraints

There are no other readily identifiable institutional or environmental constraints associated with this project that cannot be readily mitigated.

A concern with the diversion location is the possibility of flow reversals in the Sacramento River caused by the combination of low river flows and tidal effects in the Delta. Flow reversals increase the possibility of treated wastewater effluent moving upstream to the Freeport diversion structure. Studies are currently being conducted to evaluate the effect of flow reversals on the location of the Freeport diversion structure. Findings may indicate the need to stop diversions during flow reversal events.

Useful Life

It is anticipated that the water treatment plant and all associated facilities would have a minimum useful life of 40 years. The plant could be built in phases such that additional capacity could be added, as needed. However, the quantity of land and sizing of the diversion structures should be based on the ultimate size of the treatment plant.

Cost

The estimated cost for the 85 mgd SCWA Freeport WTP including the diversion structure and raw water conveyance is based on recent feasibility and preliminary design studies completed for the Freeport Regional Water Project. The estimated cost is \$280M (includes admin, engineering, and contingency).

COMPONENT:	SCWA/CITY OF SACRAMENTO JOINT PROJECT
<u>COMPONENT SUMMARY</u>	
Corresp. Supply Component:	Appropriative Water SMUD 1 Assignment SMUD 2 Assignment "Fazio" Water (PL-101-514) Other Transfer Water Supplies Wholesale Water Agreement(s) with City to serve portion of Zone 40 in City's American River POU
Required Facilities:	Conventional treatment plant w/ intake structure and conveyance pipelines
Capacities Evaluated:	80 mgd
Capital Costs (\$ Million):	\$274.0
<small>2002 Dollars ENR/CCI 7069</small>	

ELEMENT DESCRIPTION

General Description of Facilities

This alternative consists of SCWA purchasing 80 mgd of dedicated treatment plant capacity from the City and constructing treated water conveyance pipelines through the City to delivery water to Zone 40. This component includes the existing 6 mgd (expandable to 11 mgd) of non-dedicated capacity at the City's SRWTP. This alternative also includes appurtenant treated water conveyance facilities.

Participating/Coordinating Agencies

The alternative will require close coordination with the City of Sacramento because the City owns and operates the Sacramento River Water Treatment Plant. It is not anticipated that participation and coordination with agencies other than the City of Sacramento will be required.

Needed Environmental Documentation

Compliance with CEQA will be required for the construction of the conveyance and treatment facilities. In addition, an EIS will likely be required for the diversion from the Sacramento River to comply with NEPA. The diversion structure in the Sacramento River and the crossing of a streambed with conveyance facilities will require a Streambed Alteration permit from the California Department of Fish and Game and a 404 permit from the U.S. Army Corps of Engineers.

Institutional/Environmental Constraints

A potential constraint is the limited control SCWA has on the project. At present the City of Sacramento is expanding their surface water treatment capacity to meet both the City's growing demands as well as other purveyors demands (including Zone 40). The City is currently pursuing (1) expansion of Fairbairn WTP, (2) expansion of the Sacramento River WTP, and (3) construction of a new North Natomas WTP. The ultimate decision on when and where additional treatment capacity becomes available will rest primarily with the City of Sacramento and it is anticipated that SCWA will have limited input into the decision process.

Useful Life

It is anticipated that the water treatment plant and all associated facilities would have a minimum useful life of 40 years.

Cost

Costs for purchasing up to 80 mgd of treatment plant capacity from the City of Sacramento is based on a methodology consistent with the current wheeling agreement between SCWA and the City for water treated and delivered to the Franklin Blvd connection. The total cost is estimated to be \$274M (includes admin, engineering, and contingency).

COMPONENT:	RECYCLED WATER
<u>COMPONENT SUMMARY</u>	
Corresp. Supply Component:	Recycled Water
Required Facilities:	Tertiary treatment at Sacramento Regional Wastewater Treatment plant storage Zone 40 storage and distribution
Capacities Evaluated:	7 mgd
Capital Costs (\$ Million):	Phase 2 (7 mgd) - \$15.0
<small>2002 Dollars ENR/CCI 7069</small>	

ELEMENT DESCRIPTION

General Description of Required Facilities

The primary facilities associated with this element include treatment at the Sacramento Regional Wastewater Treatment Plant (conventional secondary treatment followed by filtration and disinfection), conveyance to Zone 40, and storage and distribution within Zone 40. Providing recycled water to currently developed areas will require retrofitting existing irrigation systems that are presently connected to potable water supplies. The development of a tertiary treatment facility at the Sacramento Regional County Sanitation District for urban landscaping has previously been analyzed by the Sacramento Regional County Sanitation District as part of the Sacramento County Water Reclamation Study (Nolte and Associates, 1994). Urban Use Phase 1 (5 mgd recycled water program that will produce 2 mgd for Zone 40) has been completed. This project delivers recycled water from the wastewater treatment plant to areas adjacent to the plant. This includes approximately 1000 AF/Yr to be delivered to the Laguna area of Zone 40. Phase 2 will increase the tertiary treatment plant capacity from 5 mgd to 10 mgd (7 mgd total for Zone 40). Associated Zone 40 facilities include additional conveyance pipeline, storage facilities, and booster pumps.

Participating/Coordinating Agencies

This element will require the participation and coordination with the Sacramento Regional County Sanitation District who operates the tertiary treatment plant at the Sacramento Regional Wastewater Treatment Plant site.

Needed Environmental Documentation

Compliance with the CEQA will likely be required for the construction of the conveyance and treatment facilities. The pipeline route will cross a creek and therefore may require a Streambed Alteration permit from the California Department of Fish and Game and a 404 permit from the U.S. Army Corps of Engineers.

Institutional/Environmental Constraints

It is not anticipated that the installation or operation of these facilities will be subject to institutional or environmental constraints that cannot be readily mitigated.

Useful Life

The conveyance facilities are anticipated to have a minimum useful life of 40 years.

Cost

The estimated capital cost for conveying recycled water to Zone 40 from the Sacramento Regional County Sanitation District is estimated to be \$15.0M for phase 2 facilities (includes admin, engineering, and contingency).



SACRAMENTO COUNTY
WATER AGENCY

Zone 40 Water Supply Master Plan