4.7 WATER RESOURCES

The 2002 Zone 40 WSMP identifies the facilities and financing mechanisms needed to implement a phased water supply program to meet water needs within the 2030 Study Area. The 2002 Zone 40 WSMP defines a program of conjunctive use of groundwater, surface water, and recycled water supplies and includes a financing plan for construction of a new surface water diversion structure (included in the 1987 WSMP and assessed in the Draft EIR for the Freeport Regional Water Project [FRWA 2003]), surface water treatment plant, water conveyance pipelines, and groundwater extraction, treatment, and distribution facilities. These facilities would be used for the production, conservation, transmission, and distribution of wholesale and retail water supplies in the 2030 Study Area. Surface water supplies for the 2030 Study Area would come from the Sacramento and American rivers, and groundwater would be pumped from the Central Basin of Sacramento County.

<u>Relationship to the Water Forum Agreement.</u> As described in Section 3, Project Description, the 2002 Zone 40 WSMP was prepared with the Water Forum Agreement (WFA) as its foundation. The EIR prepared for the WFA evaluated the environmental effects of a large-scale program of interrelated actions designed to provide a reliable water supply for the Sacramento region to the year 2030.

As a participant in the Water Forum process and a signatory to the WFA, SCWA's water supply needs, in combination with other water supply needs in the region, were evaluated in the 1999 Water Forum EIR. As an outcome of that process, SCWA has agreed to a series of actions and commitments related to surface water diversions, dry-year supplies, fishery flows, habitat management, water conservation, and groundwater management. The 2002 Zone 40 WSMP is the next step in the implementation process in that it addresses the financing and facilities needed to divert, treat, and convey the water supplies contemplated in the WFA. Because of the direct relationship of the 2002 Zone 40 WSMP to the WFA, the EIR for the WFA is incorporated herein by reference in its entirety (Final Environmental Impact Report for the Water Forum Proposal, October 1999; State of California Clearinghouse Number 95082041; City of Sacramento Control Number 8810; County of Sacramento Control Number 98-PWE-0648). Copies of the EIR are available for review at the following locations: 1) Sacramento County Department of Environmental Review and Assessment, 827 7th Street, Room 220, Sacramento, California 95814; 2) City-County Office of Metropolitan Water Planning, 660 J Street, Suite 260, Sacramento, California 95814; and 3) at the Water Forum website, www.waterforum.org. Portions of the Water Forum EIR are summarized or briefly described in the subsections below, as appropriate.

<u>Relationship to the Freeport Regional Water Project.</u> The environmental effects of construction and operation of a surface water diversion facility on the Sacramento River at Freeport, conveyance facilities, and a surface water treatment plant to serve Zone 40 (elements of the 2002 Zone 40 WSMP) were analyzed in the Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the Freeport Regional Water Project prepared by the Freeport Regional Water Authority (FRWA, a joint powers agency formed by

the SCWA and East Bay Municipal Utility District [EBMUD]) and the U.S. Bureau of Reclamation (USBR). The Draft EIR/EIS analyzes in detail a water supply project with a design capacity of 185 mgd, (Alternatives 2 through 5) of which up to 85 mgd would be diverted under SCWA's existing USBR water service contract and other water entitlements described in Section 3, Project Description. The Draft EIR/EIS also evaluates in an equal level of detail an alternative that includes a smaller diversion facility that would serve SCWA only (Alternative 6). Because of the direct relationship of the 2002 Zone 40 WSMP to the Freeport Regional Water Project, the Draft EIR/EIS for the Freeport project is incorporated herein by reference (Draft EIR/EIS for the Freeport Regional Water Project, August 2003; State of California Clearinghouse Number 2002032132. Copies of the Draft EIR/EIS are available for review at the following locations: 1) Sacramento County Department of Environmental Review and Assessment, 827 7th Street, Room 220, Sacramento, California 95814; 2) Freeport Regional Water Authority, 1510 J Street, Suite 140, Sacramento, California 95814; and 3) at the FRWA website, www.freeportproject.org. Portions of the Freeport Draft EIR/EIS are summarized or briefly described in the subsections below, as appropriate, and the reader is referred to specific pages of that document.

4.7.1 EXISTING CONDITIONS

SURFACE WATER

Major surface waters in the vicinity of Zone 40 include the American River, Folsom Reservoir, and Lake Natoma to the north; Sacramento River to the west; and Cosumnes River to the southeast (see Exhibit 4.1-1). Other surface waters within or near the Zone 40 2030 Study Area include Deer Creek, which is tributary to, and parallels the Cosumnes River on the north, and the Morrison Creek Stream Group (Morrison, Elder, Gerber, Unionhouse, Florin, and Laguna creeks), which generally flow in a southwesterly direction in this area of southern Sacramento County.

Sacramento River

The Sacramento River drainage basin upstream of Zone 40 encompasses approximately 23,500 square miles and produces an average annual runoff of about 17,000,000 acre-feet (af) at the Freeport gaging station (below the confluence with the American River). Principal reservoirs controlling flows in the lower Sacramento River include Lake Shasta (4,552,100 af) on the Sacramento River upstream of Redding, Trinity Lake (2,448,000 af), which regulates deliveries made to the Sacramento River from the Trinity River basin, Lake Oroville (3,538,000 af), and Folsom Reservoir (975,000 af). Based on the 30-year record of data for the period 1968 through 1998, which spans a variety of water year types, individual monthly average flows have ranged from a low of 4,500 cubic feet per second (cfs) in October 1978 to a maximum of 87,000 cfs in January 1997. Overall, the average monthly flows of all 30 years range between 13,000 and 40,600 cfs, with the lowest flows occurring in October and peak flows in February. The 30-year average monthly flow during the wetter months of December through May is 32,200 cfs; during the typically drier months of June through November, it is 16,500 cfs.

American River

The American River drainage basin encompasses approximately 1,900 square miles. Folsom Reservoir is the principal reservoir in the basin with a capacity of 975,000 af; several smaller reservoirs upstream contribute another 820,000 af of storage capacity. Nimbus Dam impounds Lake Natoma downstream of Folsom Dam and regulates releases from Folsom Reservoir to the lower American River. The entrance facilities to the Folsom South Canal are located along the south shore of Lake Natoma immediately upstream of Nimbus Dam. Mean annual flow in the lower American River is 3,300 cfs; the design capacity of the channel for flood flows is 115,000 cfs.

Cosumnes River

The Cosumnes River watershed extends from the headwaters, at an elevation of approximately 7,500 feet on the western slope of the Sierra Nevada, to the confluence with the Mokulumne River, approximately 10 miles south of the study area. The Cosumnes River is the last major river on the western slope of the Sierra Nevada with no major dams. Minor dams on the river are used for recreational purposes. Hydrology of the Cosumnes River has changed substantially since development of the region and was likely the source of surface water diversions for agriculture since the 1800s. Until the 1940s, the Cosumnes River flowed year-round because it received baseflow from the extensive floodplain aquifer. Historical data suggest that flow volumes in the lower basin steadily decreased from 1942 to 1982, with more frequent periods of very low or no flow. During September and October, flows in the river are 27-30 cfs. Currently, surface flow ceases in a 5- to 10-mile section of the river (between Meiss Road and State Route 99) nearly every year at the end of California's dry season. Groundwater pumping is at least partly responsible for the decline in fall flows. Beneficial uses of the river are municipal supply, agriculture, recreation, freshwater habitat, migration, spawning, and wildlife habitat. See Section 4.6, Biological Resources, for further discussion of the Cosumnes River.

SURFACE WATER QUALITY

Water quality parameters for the lower American River have typically been well within acceptable limits to achieve water quality objectives and designated beneficial uses. Constituents of concern are primarily the result of urban land use practices and associated runoff and stormwater discharge.

Sacramento River monitoring studies indicate that the river's water is generally of good quality, but is affected by urban runoff, stormwater discharges, agricultural runoff, effluent discharge, and acid mine drainage. Concentrations of some priority pollutants occasionally exceed State water quality objectives in portions of the river.

Water quality of the American and Sacramento rivers is described in more detail in the EIR for the Water Forum Proposal (1999) at pages 4.4-2 through 4.4-6.

Water quality in the Cosumnes River watershed is affected by several factors, primarily land-use and land cover. Monitoring data indicate that most of the river's nutrients and suspended sediments originate from the lower portion of the watershed below the Michigan Bar gauging station. Nutrient loading is strongly affected by a few point sources (e.g., wastewater treatment facilities in El Dorado County) and from nonpoint sources related to urban areas and agriculture (Ahearn and Dahlgren 2000).

Central Valley Project and State Water Project

The Central Valley Project (CVP) is a multipurpose project operated by the U.S. Bureau of Reclamation (USBR) that stores and transfers water from the Sacramento, San Joaquin, and Trinity River basins to the Sacramento and San Joaquin Valleys. The State Water Project (SWP) is a project operated by the California Department of Water Resources (DWR) that supplies water to approximately 30 agencies throughout California. Descriptions of the CVP and SWP can be found in the Draft EIR for the Water Forum Proposal (1999) at pages 4.3-1 through 4.3-3.

Existing Surface Water Supply

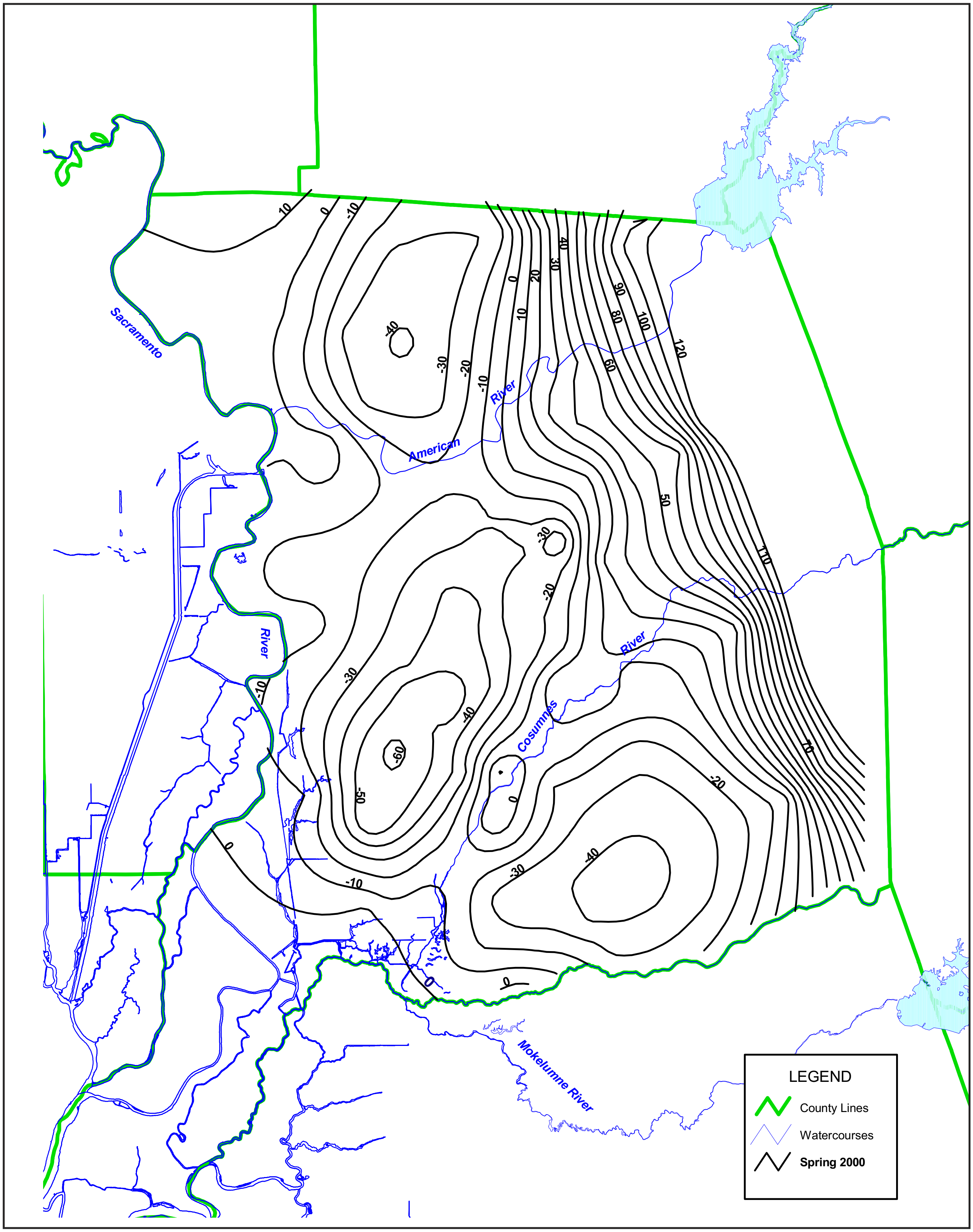
Water supply to Zone 40 currently comes primarily from groundwater. Approximately 4,500 afy of surface water (a portion of SCWA's 15,000 afy CVP contract water [P.L. 101-514]) is wheeled through City of Sacramento facilities for use in the Laguna/Franklin area, which is within Zone 40, and 2,066 afy of surface water is used in the Sunrise area as short-term replacement water because of contamination of local groundwater supplies.

GROUNDWATER

The Sacramento County groundwater system is part of the larger Sacramento Valley groundwater basin. Geology of the basin and groundwater recharge mechanisms are described in the Water Forum EIR at pages 4.2-1 and 4.2-2, a discussion of historical groundwater decline is found at page 4.2-5, and a discussion of land subsidence is found at page 4.2-7.

Within Sacramento County; three separate groundwater subbasins have been identified: North Area (area north of the American River), Central Area (roughly the area between the American and Cosumnes River), and South Area (generally the area south of the Cosumnes River). Historical groundwater use in each subbasin has resulted in the development of three regional cones of depression. The spring 2000 groundwater elevations shown in Exhibit 4.7-1 show the location of the cones of depression in each subbasin. Each of the groundwater areas is described below:

- **North Area.** The North Area corresponds to that portion of the North American Sub-Basin, as defined by the California Department of Water Resources (DWR) (DWR Basin Number 5-21.64) located within Sacramento County. Basin 5-21.64 extends north into Placer and Sutter Counties. The North Area is bounded on the west by the Sacramento



Source: Based on measured spring 2000 water level data from Sacramento County Department of Water Resources

Groundwater Elevation (ft,msl) Contour, Spring 2000

EXHIBIT 4.7-1

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River, on the north by the Sacramento-Placer/Sutter County line, and on the south by the American River.

- **Central Area.** The Central Area corresponds to the South American Sub-Basin (DWR Basin Number 5-21.65). The Sacramento County Integrated Groundwater Surface Water Model (IGSM) subregions representing the Central Area are shown in Exhibit 4.7-2. This sub-basin is located between the American River and the Cosumnes River. Zone 40 is located within the Central Area. (Note: The Central Area basin is referred to in the Water Forum EIR as the "South Sacramento Area.")

- **South Area.** The South Area (Galt Area) corresponds to that portion of the DWR Cosumnes Sub-Basin (DWR Basin Number 5-22.16) located within Sacramento County. In the Sacramento County IGSM, the South Area is bounded on the north and west by the Cosumnes River, on the east by the boundary of the groundwater basin, and on the south by the Sacramento County line. (Note: The South Area basin is referred to in the Water Forum EIR as the "Galt Area.")

Existing Water Use

An estimate of existing water use was made to establish a baseline for modeling purposes, and from which to assess impacts to groundwater resources. The 2000 Baseline (described in more detail in Groundwater Methodology, below) reflects a theoretical groundwater condition assuming 2000 levels of development and associated groundwater extraction over the 74-year period of hydrologic record. Because all groundwater pumping in Zone 40 is not directly measured, assumptions must be used to establish a baseline that provides a reasonable estimate of total existing groundwater use.

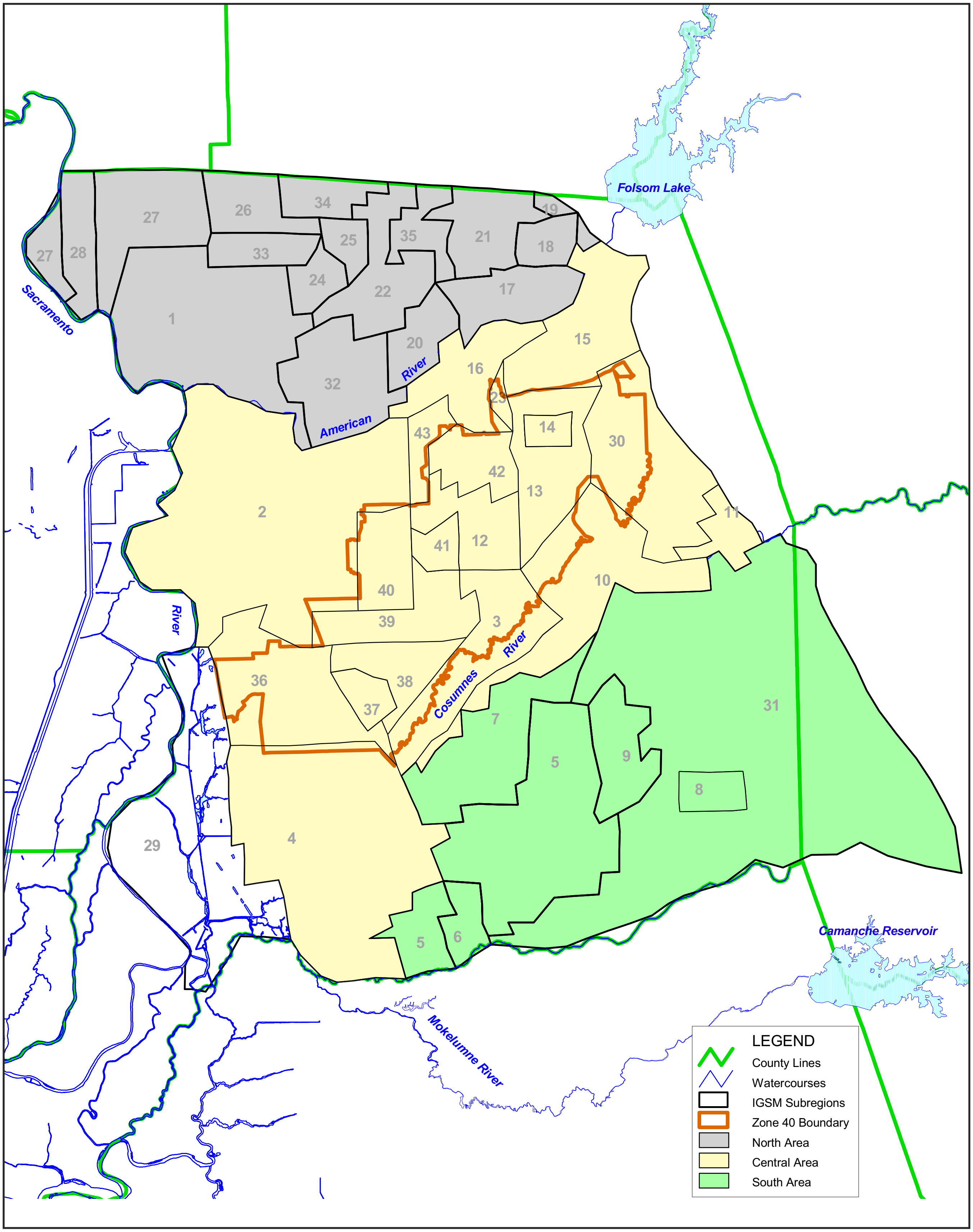
DWR conducts land use surveys by county in California to estimate changing water demands. The surveys are completed about every five to seven years for each county. The Standard Land Use Legend (DWR 1999) includes the list of the land uses mapped in the survey process. Land Use surveys are available for Sacramento County for 1976, 1984, 1993, and 2000.

Land use classifications identify lands with similar water use, infiltration, and runoff characteristics. The following five classes of general land use conditions have been identified for this analysis:

- Agricultural land (AG), generally consisting of areas greater than 5 acres currently used for agriculture;

- Agricultural-Residential (Ag-Res), generally consisting of 2- to 5-acre parcels zoned for agricultural and residential use;

- Urban (Urban), consisting of different types of municipal, commercial, or industrial development;



Source: WRIME 2003

Sacramento County IGSM of Groundwater Subregions

EXHIBIT 4.7-2

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- Native Vegetation/Undeveloped (NV), consisting of areas that have not been developed. These areas may be used for dryland grazing; and
- Riparian Vegetation (RV), generally consisting of areas along waterways.

Typically, agricultural land, agricultural-residential land (ag-res), and urban land receive applied water, while native vegetation/undeveloped, and riparian lands do not receive any water except rainfall. The estimated acreage for each of these land use classes in Sacramento County was developed from a Geographic Information System (GIS) analysis of the available land use data (see Appendix F, Table 4.1). The 2000-level land use data were developed based on a GIS analysis of the 2000 DWR land use survey (most recent survey) for Sacramento County and are the best data available to indicate existing conditions. Year 2000 land use data for the 2030 Study Area are presented in Table 4.7-1 and shown in Exhibit 4.7-3.

Table 4.7-1
Zone 40 Land Use 2000 Baseline Condition (Acres)

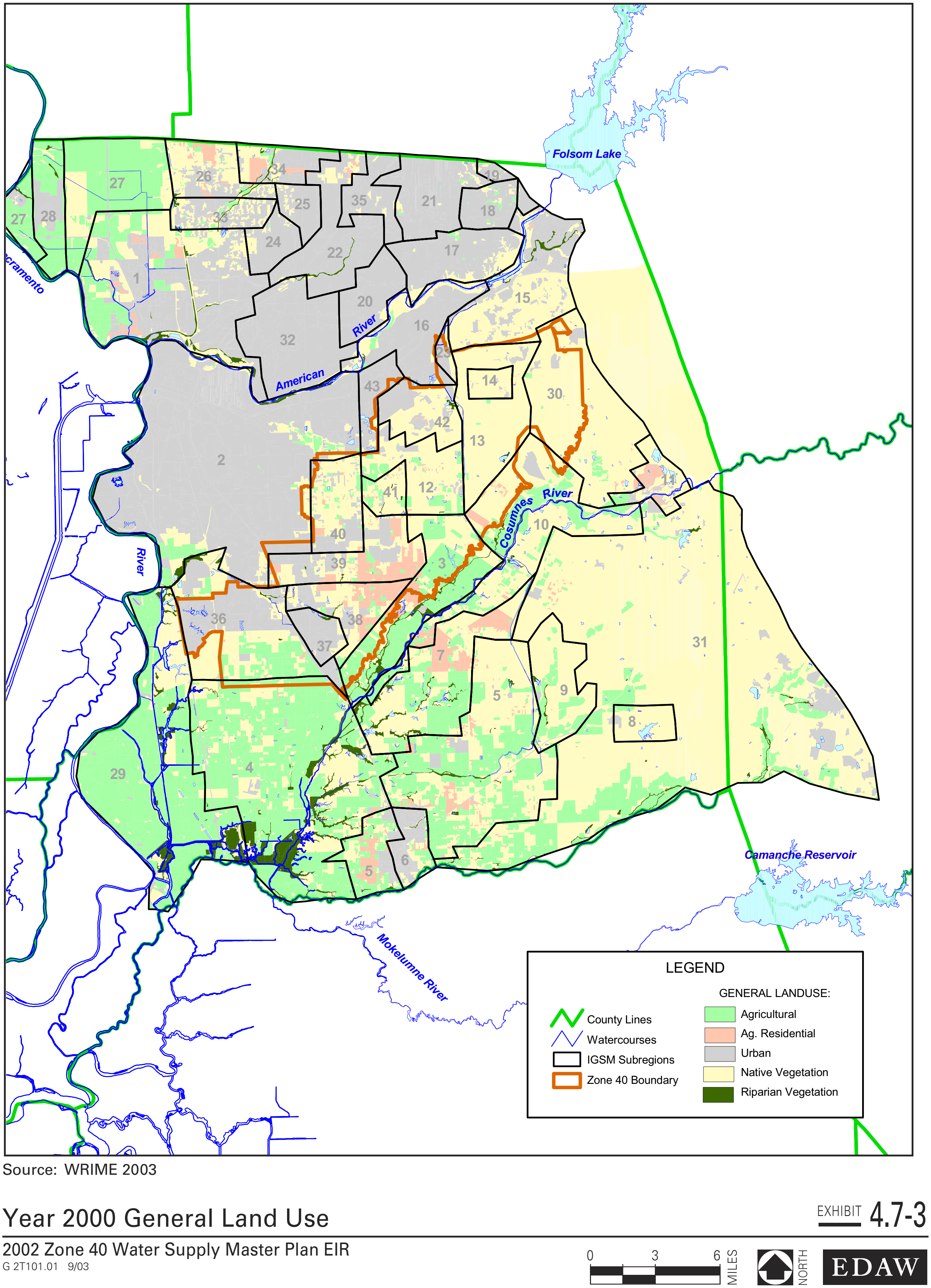
Subregion Number	Subregion Name	Agricultural	Urban	Agricultural-Residential[1]	Riparian Vegetation	Native Vegetation	Total Subregion Area
13	Sunrise Douglas – SCWA	96	221	9	27	10,271	10,624
14	Security Park – Cal Am	1	84	2	0	1,662	1,749
23	Sunrise – SCWA	0	525	0	0	389	914
36	Laguna/Franklin – SCWA	3,323	7,608	50	271	5,901	17,153
38	SCWA/EGWS Retail	582	783	1,953	33	2,646	5,997
39	Vineyard – SCWA	1,603	976	2,419	20	3,765	8,783
40	N. Vineyard in POU – SCWA	540	1,677	301	0	3,919	6,437
41	N. Vineyard out POU – SCWA	473	38	87	27	1,753	2,378
42	Mather	7	2,167	28	47	3,507	5,756
Total		6,625	14,079	4,849	425	33,813	59,791

[1] Agricultural-Residential land use represents a mixture of urban and agricultural areas.

Source: WRIME 2003

Agricultural Water Use

Agricultural water demand was estimated based on crop acreage data. The crops grown in Sacramento County are aggregated into eleven crop categories for purposes of water demand calculations. The 2000 level crop acreages in Zone 40 total 6,625 acres. Crop distribution is shown in Exhibit 4.7-4. Acreage of specific crop type by subarea for the North Area, Central Area (including Zone 40), and South Area are shown in Appendix F, Hydrologic Modeling Analysis for the Zone 40 Water Supply Master Plan, Table 4.4.



Source: WRIME 2003

Year 2000 General Land Use

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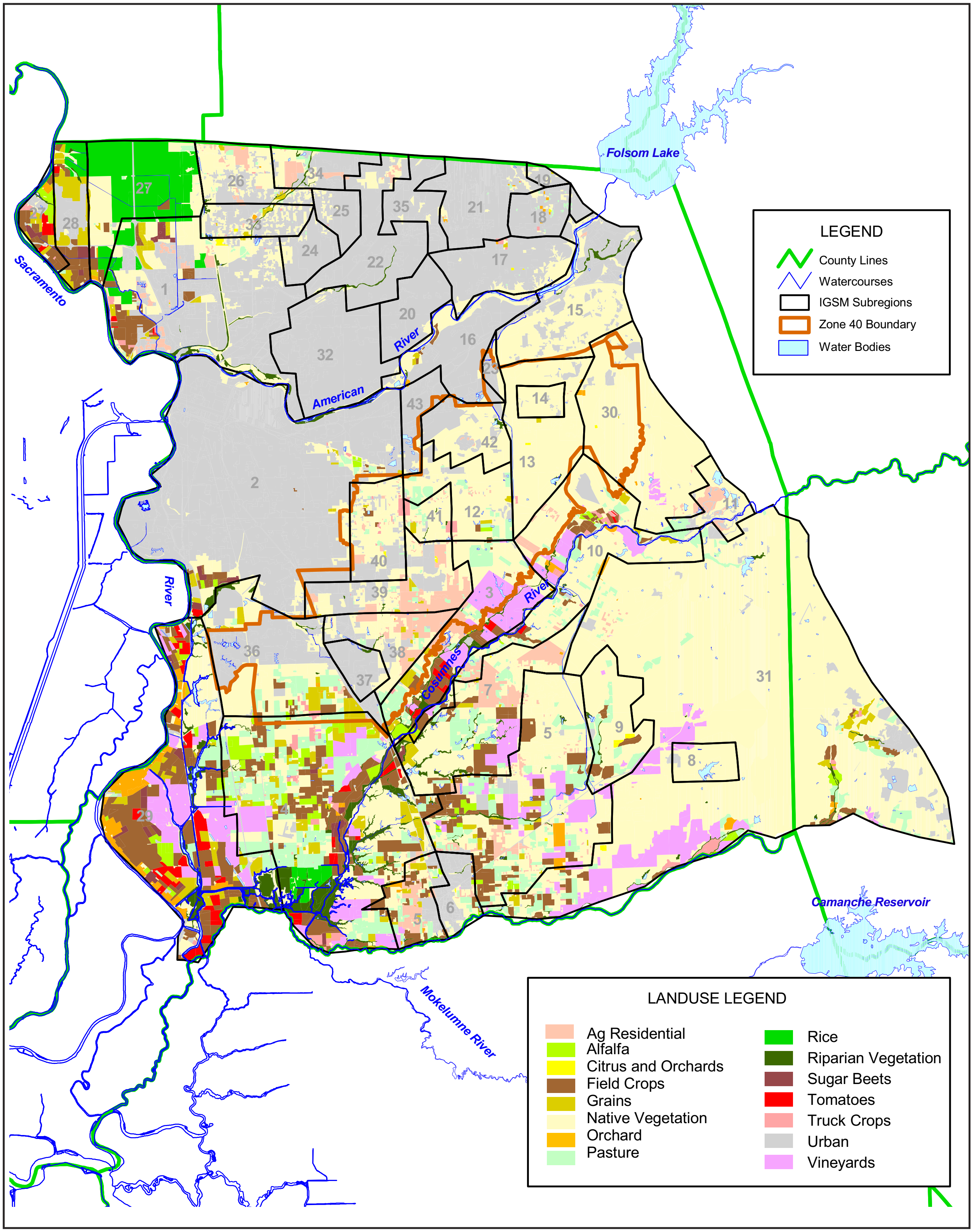

Source: WRIME 2003

Year 2000 Crop Distribution

EXHIBIT 4.7-4

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Estimates of agricultural water demand were made based on the water use of a given crop type, precipitation, crop acreage, evapotranspiration data, and irrigation efficiency (see Appendix F, Hydrologic and Modeling Analysis for Zone 40 Water Supply Master Plan). In the 2030 Study Area, the average annual baseline agricultural demand totals about 28,400 afy (Appendix F, Table 4.6).

Urban Water Use

Urban water use includes both indoor and outdoor water use for municipal and industrial land uses. Outdoor urban water used in Sacramento generally infiltrates into upper aquifers or reaches local storm drains and is discharged to surface waters. Indoor urban water used in Sacramento is ultimately routed to the Sacramento Regional Wastewater Treatment Plant (SRWWTP), treated, and discharged to the Sacramento River. Because most indoor urban water disposal is sewered, there is no direct infiltration into the groundwater basin. In more rural areas, water used indoors is disposed of through septic systems, which may provide some infiltration to the groundwater basin where soils are suitable for this to occur. In areas with suitable soils, a portion of water used outdoors to irrigate lawns or water trees and plants that is not consumed by the plants or evaporated infiltrates into the groundwater basin.

The 2000 level urban water use data was developed based on the land uses described above. Urban water use was estimated by assigning different water demand factors to urban land use types as described in Estimate of Annual Water Demand within Sacramento County-Wide Area (Boyle Engineering Corporation 1995). The water demand factors were modified to reflect more recent water use data which support a 12% level of conservation, which is a prorated rate of the Water Forum's 25.6% level of conservation goal for 2030. Urban acreage (urban plus a portion of agricultural-residential) in the Zone 40 Service Area totaled approximately 17,900 acres in 2000 (Appendix F, Table 4.6).

Remediation Pumping and Reinjection

Approximately 18,700 afy of groundwater are currently pumped from several locations in the Central Area for purposes of remediation of contaminated groundwater. Approximately 3,300 afy are reinjected into the groundwater basin. Most of this occurs at Mather Field (1,774 afy) and Aerojet/Boeing (about 1,462 afy), with small injection volumes at Kiefer Landfill.

GROUNDWATER QUALITY

Title 22 of the California Code of Regulations contains standards for drinking water quality. Central Area groundwater prior to treatment presently meets Title 22 drinking water quality standards, with the exception that in some areas iron and manganese exceed secondary standards related to aesthetic concerns and arsenic exceeds the maximum contaminant level of 10 micrograms per liter (μg/l). Elevated levels of iron and manganese do not pose a health hazard but may result in taste and color problems and staining of plumbing fixtures and laundry. Chronic (long-term) exposure to inorganic arsenic (the type of exposure generally associated with public water systems in the United States) is linked to a variety of health effects, including various types of cancer and cardiovascular, pulmonary, immunological, neurological, and endocrine effects. Groundwater quality is described in more detail in the Water Forum EIR at pages 4.2-6 and 4.2-7.

Nine sites within Sacramento County have been identified as having significant locally contaminated groundwater. These sites include the following four USEPA Superfund sites: Aerojet Corporation, the former Mather AFB, the former McClellan AFB, and the Sacramento Army Depot. Other sites include the Kiefer Landfill, the abandoned PG&E site adjacent to the Sacramento River near Old Sacramento, the Southern Pacific Railroad yards in downtown Sacramento and the City of Roseville, and the Union Pacific Railroad yard near downtown Sacramento (SCWA 1997). See Appendix E of the Water Forum EIR for a discussion of each of these groundwater contamination sites.

GROUNDWATER MANAGEMENT ELEMENT OF THE WATER FORUM AGREEMENT

The Groundwater Management Element of the WFA is described in the Water Forum EIR at pages 3-26 through 3-27, and at pages 4.2-4 through 4.2-5. The Groundwater Management Element provides recommendations on groundwater sustainable yield and includes the basic provisions for a groundwater management governance structure. The purpose of groundwater management under the WFA is to maintain access to a safe and reliable supply of water. The Groundwater Management Element states that a governance structure should recognize the different problems and conditions of each groundwater subarea and provide for local control in each subarea of the basin. Localized control within an overall regional governance structure is seen as the most effective means to address these varying problems and conditions. The Sacramento Groundwater Authority (SGA), established in August 1998, includes a representative from each water purveyor in the North Area, the cities of Sacramento and Folsom, and the County of Sacramento. Negotiations for governance in the Central Area are in progress.

For the Central Area, the long-term average annual sustainable yield recommended by the Water Forum is 273,000 afy. This represented the Water Forum's year 2005 projected pumping volume and exceeded 1990 pumping levels by approximately 23,000 afy. Based on modeling conducted for the Water Forum, the groundwater level in the Central Area basin was projected to stabilize at an average elevation of approximately -116 to -130 feet msl at the lowest level within the cone of depression.

4.7.2 ENVIRONMENTAL IMPACTS

THRESHOLDS OF SIGNIFICANCE

The significance criteria described below were developed for use in assessing potential effects to water resources resulting from implementation of the WFA, and are appropriate to assess impacts of implementation of the 2002 Zone 40 WSMP.

Changes in surface water quantity and/or quality were considered to represent a significant impact if the 2002 Zone 40 WSMP would result in:

- Substantial decreases in surface water flows such that existing beneficial uses are compromised;
- Substantial decreases in annual deliveries to SWP or CVP customers relative to the corresponding year of the Base Condition as described in the Water Forum EIR;
- Increased levels of any priority pollutant or other regulated water quality parameter in a waterbody such that the waterbody would more frequently exceed State and/or federal numeric or narrative water quality standards, objectives, or criteria; or
- Substantial degradation of existing water quality on a long-term basis, even if State water quality objectives would not be exceeded, thereby causing substantial adverse effects to one or more beneficial uses designated for a given waterbody.

Changes in groundwater quantity and/or quality were considered to represent a significant impact if the 2002 Zone 40 WSMP would result in:

- Substantial decrease in surface water flows of the Cosumnes River such that existing beneficial uses are adversely affected;
- Groundwater quality not meeting the Title 22 of the California Code of Regulations for drinking water standards;
- Substantial increases in groundwater movement rates such that groundwater contaminants in each of the nine sites identified above threaten to affect additional wells;
- Substantial increase in the risk of land subsidence caused by declines in groundwater level; or
- Decrease of both the yield and efficiency of a substantial percentage of municipal, agricultural, or rural domestic wells, indicating that groundwater levels dropped below the pump opening.

METHODOLOGY

The 2002 Zone 40 WSMP would implement a program of conjunctive use of groundwater, surface water, and recycled water supplies for use in the 2030 Study Area of Zone 40. Methods used to assess impacts to water resources are described below.

Surface Water Methodology

Surface water that would be supplied to Zone 40 was analyzed in the Water Forum EIR as a component of the regional diversions that would occur under the WFA. That analysis was based on a set of specific model simulations, each defining a specific hydrologic condition (i.e., Base Condition, Base plus WFA, Future (2030) Cumulative Condition, and No Project). For impact assessment, model-generated output was compared between various simulations depicting different hydrologic and environmental conditions, and incremental impacts of the WFA and cumulative future impacts could be quantified. The impact assessment framework and methodology for the WFA is described in detail in the Water Forum EIR at pages 4.1-4 through 4.1-12, and modeling assumptions and results are contained in Volume II, Appendices G, I, J, and K.

Surface water diversions by SCWA that would serve Zone 40 were also analyzed in the Draft EIR/EIS for the Freeport Regional Water Project, prepared by FRWA and USBR. Hydrologic impacts of the Freeport Regional Water Project were evaluated primarily with the DWR/USBR hydrologic simulation model CALSIM II. Modeling procedures and assumptions for the analysis are described in the Freeport Draft EIR/EIS at pages 3-7 through 3-9, and in Volume 3, Modeling Technical Report, of that document.

In the Water Forum EIR, 2030 surface water diversions by SCWA were analyzed in aggregate with other proposed surface water diversions in the region, exceeding an average of 463,000 afy (see Water Forum Draft EIR Table 4.1-2 at page 4.1-8). These combined diversions were characterized as the "project" for the purposes of CEQA analysis. In the Freeport Draft EIR/EIS, SCWA's diversions (up to 85 mgd, long-term average of 68,500 afy) were combined only with those proposed by EBMUD (up to 100 mgd, long-term average of 23,000 afy).

For this analysis, Sacramento County IGSM was used to simulate flow conditions of the Cosumnes River under various water management scenarios. Streamflow conditions are represented by streamflow hydrographs at different locations within the model area. To assess the differences in surface water conditions under the modeled alternatives, monthly streamflow was compared for upstream and downstream hydrograph locations on the Cosumnes River.

Groundwater Methodology

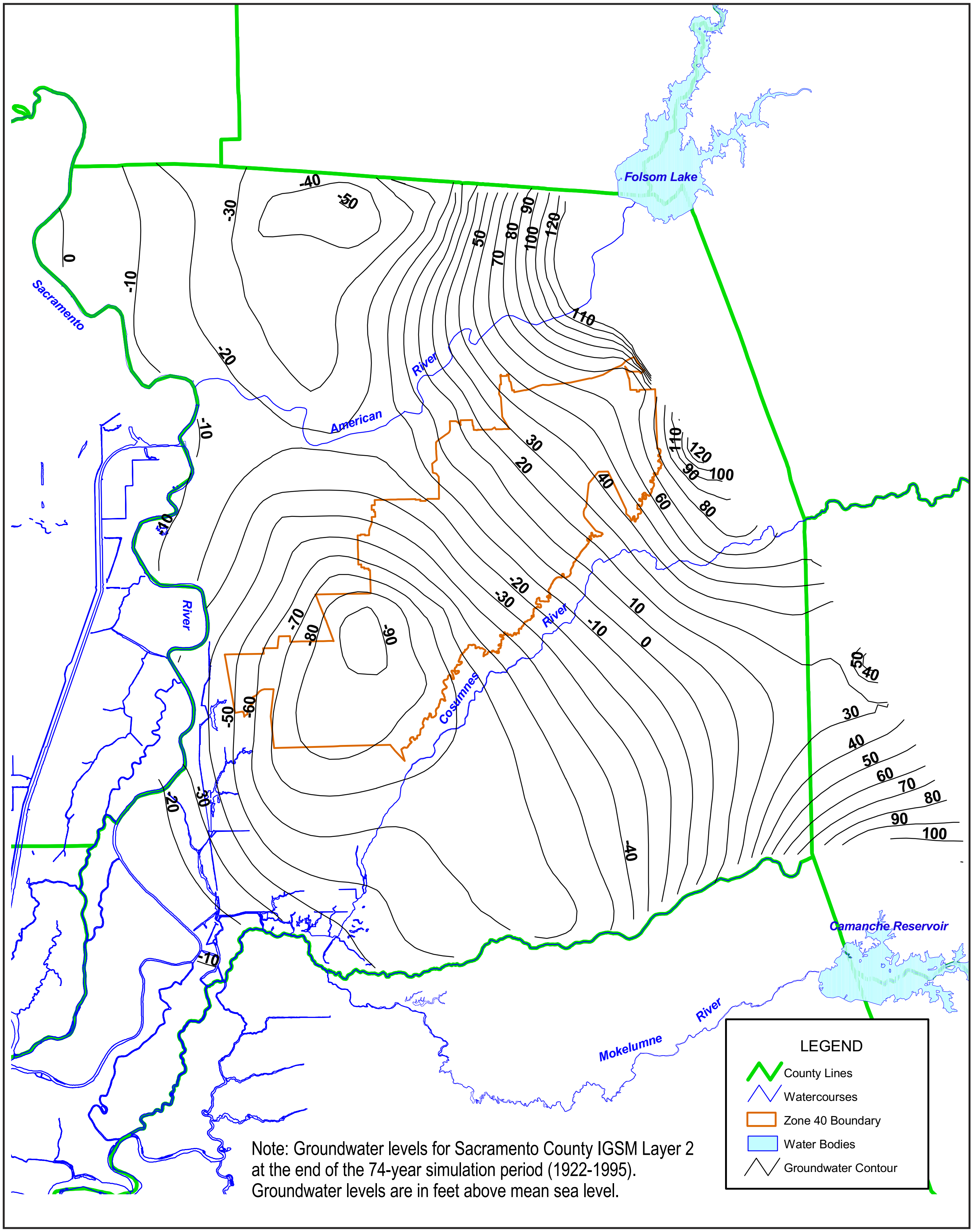
The Sacramento County Integrated Groundwater Surface Water Model (Sacramento County IGSM), developed for SCWA, was used to assess impacts on groundwater. The model was originally developed in the early 1990s to analyze the impacts of different water supply planning scenarios on the groundwater resources of Sacramento County. Before its application to the 2002 Zone 40 WSMP, the Sacramento County IGSM was reviewed for appropriateness for this use. Based on its theoretical foundation, past applications, and sensitivity testing, the Sacramento County IGSM was determined by SCWA to be appropriate for assessing impacts of the Zone 40 WSMP and is the best available tool for this purpose. Information on the Sacramento County IGSM model grid, model subregions, relationship to the groundwater subbasins, and appropriateness of application to the 2002 Zone 40 WSMP is found in Appendix F, Hydrologic and Modeling Analysis for the Zone 40 Water Supply Master Plan.

The hydrologic analysis of the 2002 Zone 40 WSMP involved definition of two basic scenarios: the 2000 Baseline Condition and 2030 Conditions. The 2000 Baseline represents the long-term effect of water demand and supply conditions at the 2000 level of development held constant over the 74-year period of known hydrology. If there are no changes in the current level of urban and agricultural demand (no new development), and no new surface water supplies, the existing groundwater pumping rate associated with this level of development would result in new groundwater levels. This theoretical scenario is used to establish a baseline from which to measure project impacts. Existing groundwater levels reflect the status of the basin as a result of groundwater and surface water operations during the historical period. These groundwater levels are substantially affected by short-term hydrologic conditions and do not necessarily represent the state of the groundwater basin over a long-term hydrologic period that reflects above- and below-normal rainfall conditions. As such, it is important to note that if development were to cease today, groundwater levels would respond to hydrologic conditions. That is, groundwater levels would decline in response to dry hydrologic conditions (below-normal rainfall) and would rise in response to wet hydrologic conditions (above-normal rainfall). The 2000 Baseline, therefore, establishes this stabilized level (which may be lower than today) over a long period of record that includes both wet periods and periods of extended drought (Exhibit 4.7-5).

The 2000 Baseline Condition within Zone 40 assumes the following:

- Land use (urban and agricultural acreage) is based on the DWR 2000 (most recent) land use survey.
- Urban demands are estimated based on the 2000 land use survey, Boyle Engineering Corporation (1995) unit water use factors modified to reflect more recent water use data that support a 12% level of conservation.
- Agricultural demands are estimated based on crop type and the DWR 2000 crop acreages.
- Surface water supplies are limited to those currently in place, and are simulated based on the DWR/USBR model CALSIM II 2000 Baseline Condition.
- Groundwater pumping is used to meet most of the demands in Zone 40.
- There is no reuse of remediated water extraction as source of water supply.

The 2030 Condition, as with the 2000 Baseline, represents the long-term effect of the 2030 level of development over the 74-year period of known hydrology. The condition assumes development of approved specific plans and associated reductions in agricultural acreage and water demand in Zone 40 and increases in surface water supplies to satisfy the increased urban demand. Groundwater pumping would still be used to supplement surface water supplies for urban areas and to meet agricultural demands. 2030 Condition assumptions within Zone 40 include the following:



Source: WRIME 2003

Modeled Baseline 2000 Groundwater Levels

EXHIBIT 4.7-5

2002 Zone 40 Water Supply Master Plan EIR

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- Land use (urban and agricultural acreage) is based on projected 2030 land use, which includes full development of approved specific plans (see Appendix F, Table 4.1, Figure 4.2, and Table 4.5).

- Urban demands are estimated based on the projected 2030 land use, unit water use factors identified by Boyle Engineering Corporation (1995) modified to reflect more recent water use data that support a 25.6% level of conservation, per the WFA.

- Agricultural demands are estimated based on crop type and estimated 2030 crop acreage.

- Surface water supplies are increased to future firm water supplies of approximately 52,400 afy, including the use of up to 4,400 afy of reclaimed water from SRWWTP.

- Groundwater supplies supplement additional surface water supplies for urban uses, and are reduced for agricultural demands due to reductions in irrigated acreage.

- Total groundwater remediation pumping at Aerojet is increased to 30,000 afy.

Model runs using variations on the 2030 Condition were conducted to illustrate potential effects related to (1) groundwater pumping locations (pumping within the subarea of use [2030 Baseline], pumping concentrated in the northern portion of Zone 40, pumping concentrated in the southern portion of Zone 40, and a uniform pumping scenario); (2) variable volumes of reuse of remediated groundwater (no reuse, 50% reuse, and complete reuse); (3) increases in surface water from availability of appropriative water; and (4) enhancement of Cosumnes River flows by 5,000 afy in conjunction with the above variations. (Note: Cosumnes River flow enhancement is not proposed as an element of the 2002 Zone 40 WSMP.) A 2030 Baseline was established for purposes of comparison that assumes that additional groundwater needed by each subregion is pumped from that subregion.

The Sacramento IGSM has been updated and refined since its application to the WFA. For the Water Forum regional pumping of 264,000 afy was assumed, with generally a uniform pumping distribution. The methodology used for the Water Forum was also different in that groundwater results were compared to a baseline of actual 1990 measured groundwater elevations instead of to more representative, long-term simulated conditions that include the effects of wet and dry hydrologic cycles (i.e., 2000 Baseline). Because 2030 groundwater elevations are projected to be higher under the new modeling, impacts related to groundwater elevations would not be greater than those identified in the Water Forum EIR and would likely be less.

Modeling Results

Modeling results are fully described in Appendix F, Hydrologic and Modeling Analysis for the Zone 40 Water Supply Master Plan. Output includes, among other things, groundwater levels depicted as hydrographs (changes in groundwater elevation with time) at each of 22 geographic locations (A through V) throughout the County over the 74-year period of record;

groundwater contour maps showing groundwater elevations resulting from specific scenarios; stream hydrographs at specific locations on the American and Cosumnes rivers; and flow exceedance probability curves on the Cosumnes River. Locations were selected to establish a good representation of the County, and to include sensitive areas along the Cosumnes River and cones of depression (Exhibit 4.7-6).

Four streamflow hydrograph locations along the Cosumnes River were identified: (1) S3, near Michigan Bar; (2) S4, near the Folsom South Canal; (3) S5, near State Route 99; and (4) S6, near Twin Cities Road. Model output also includes streamflow hydrographs comparing surface flow at upstream and downstream locations, and flow exceedance probability curves for each alternative scenario.

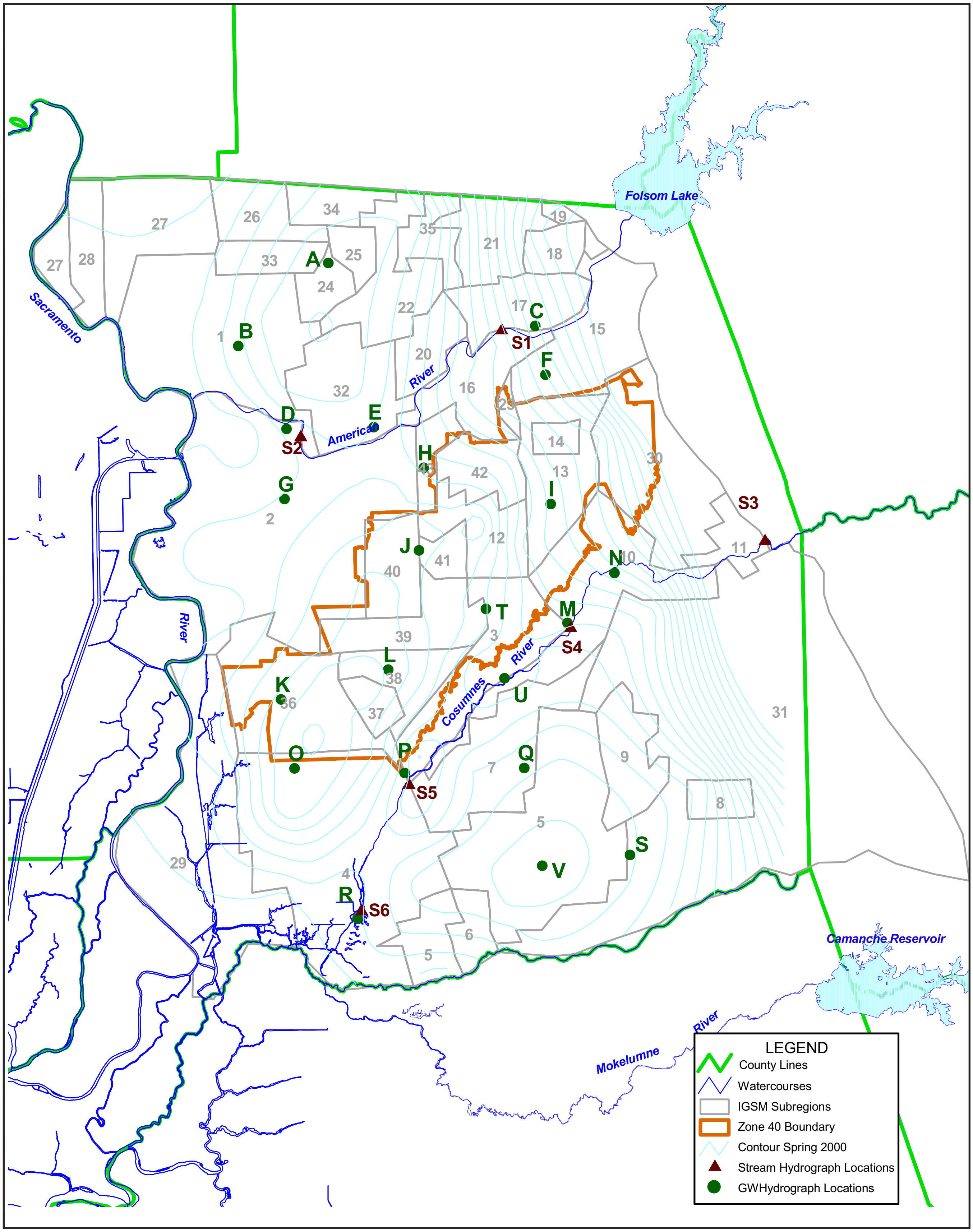
Analyses of modeling results are grouped by (1) Zone 40 Groundwater Pumping Distribution Alternatives; (2) Zone 40 Water Supply Alternatives; and (3) Groundwater Remediation/Reuse Alternatives (see Exhibit 4.7-6). Table 4.7-2 provides a summary of the water demand and supply assumptions for the Zone 40 service area and Central Basin, and a summary of results for each analysis. Note that the term "Alternative" is used here in the context of modeling scenarios only, and is not considered an alternative for CEQA analysis. See Chapter 7, Alternatives, for description and analysis of alternatives to the proposed project.

Zone 40 Groundwater Pumping Distribution Modeling Alternatives

A series of model runs was conducted to determine the effects of location of groundwater pumping. To isolate the effects of the 2002 Zone 40 WSMP, land uses outside Zone 40 were held at 2000 development levels, and 2030 development levels were assumed within Zone 40. The analysis includes only firm surface water supplies, and no reuse of remediated water was assumed. The differences in groundwater elevations attributable to the location of groundwater pumping within Zone 40 are shown in Exhibits 4.7-7 a, 4.7-7 b, and 4.7-7 c, for the Northern Zone 40 Study Area, Southern Zone 40 Study Area, and along the Cosumnes River.

Groundwater pumping produces localized depression, with reduced effect with distance. (See Appendix F, Hydrologic and Modeling Analysis for the Zone 40 Water Supply Master Plan, hydrographs for locations H, I, and J in the north, and O and P in the south.) Pumping concentration in northern Zone 40 reduces groundwater levels near the middle reaches of Cosumnes River, while groundwater levels in the vicinity of the lower reaches are affected more by pumping concentration in southern Zone 40. (See Appendix F, Hydrologic and Modeling Analysis for the Zone 40 Water Supply Master Plan, hydrographs for locations M, N, P, R, and U).

Analysis of the results of the pumping distribution scenarios suggests that, because pumping would be spread throughout the study area and not be concentrated in any region, the uniform pumping scenario (Alternative 1a) would have the least impact on groundwater levels relative to the Baseline Condition overall. Therefore, a uniform pumping distribution was assumed in the 2030 modeling scenarios.



Source: WRIME 2003

Selected Hydrograph Locations

EXHIBIT 4.7-6

2002 Zone 40 Water Supply Master Plan EIR

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0 3 6 MILES

NORTH

EDAW

Table 4.7-2
Summary of Hydrologic Impacts of the Alternatives

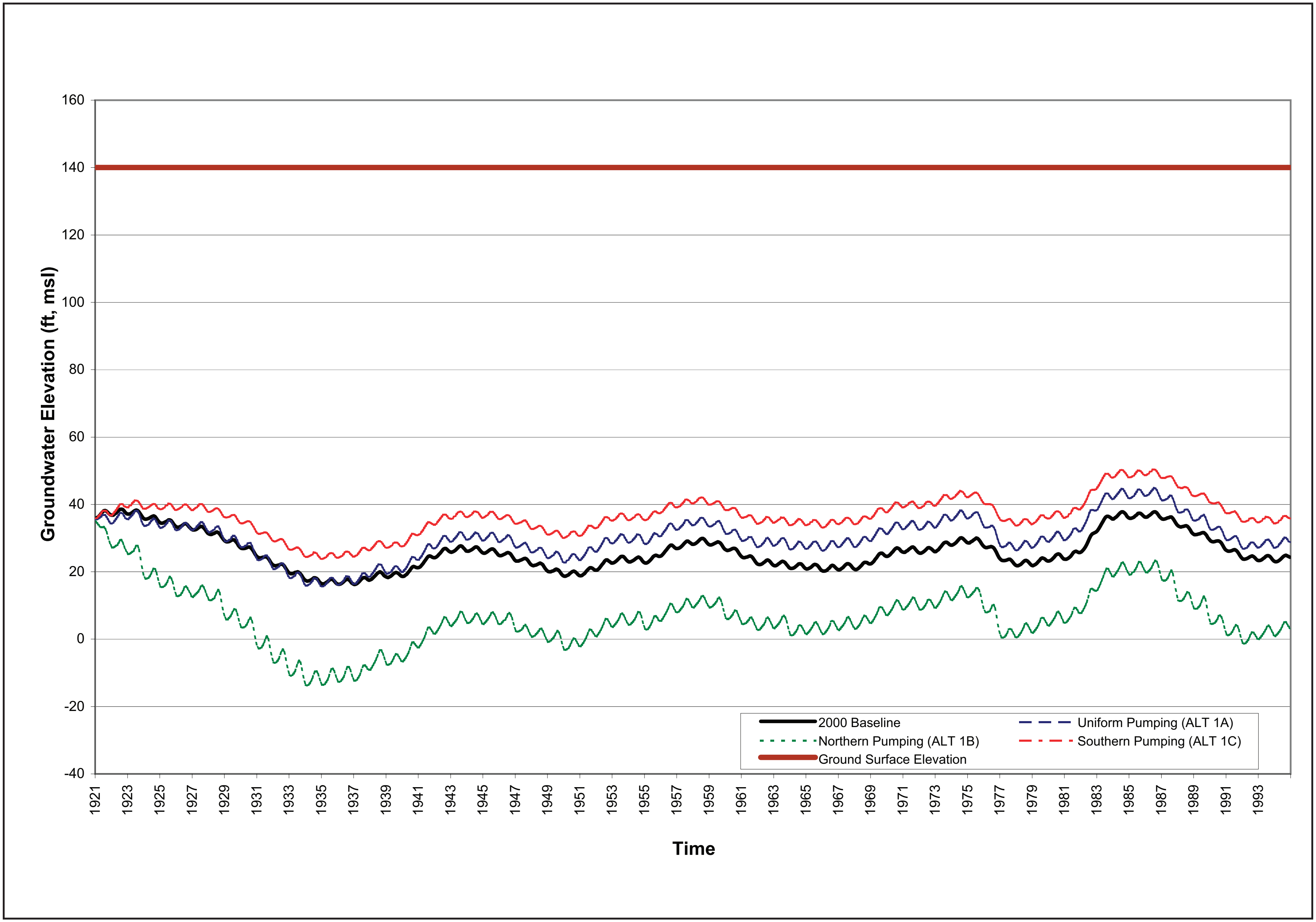
	Zone 40						Central Basin			Impact Summary			
Alternatives	AG WU (afy)	Urban WU (afy)	SW Supply[1] (afy)	GW Supply (afy)	Remediation Reuse In-Lieu of Urban Pumping (afy)	Total Groundwater Pumping[2] (afy)	Extraction (afy)	Reinjection (afy)	Cosumnes Flow Enhancement[3] (afy)	Avg GW Level (Northern Z40)[4] (msl)	Avg GW Level (Southern Z40)[5] (msl)	Avg Annual Cosumnes River Flow at SR 99 (cfs)	Avg Fall Cosumnes River Flow at SR 99 (cfs)
Zone 40 Groundwater Pumping Distribution													
BL 2000	28,418	37,816	6,566	59,751	N/A	248,554	18,664	3,276	N/A	-22.2	-70.6	318,800	40.7
ALT1a	4,976	121,126	52,357	73,856	N/A	261,702	18,664	3,276	N/A	-30.4	-83.8	319,400	41.1
ALT1b	4,976	121,126	52,357	73,847	N/A	261,671	18,664	3,276	N/A	-57.9	-50.1	319,000	41.0
ALT1c	4,976	121,126	52,357	73,855	N/A	261,701	18,664	3,276	N/A	-27.1	-91.8	319,500	41.1
Zone 40 Water Supply Availability													
BL 2030	4,976	121,126	52,357	64,702	9,400	244,049	35,890	8,014	5,000	-25.4	-60.9	323,300	48.4
ALT2a	4,976	121,126	52,357	64,618	9,400	244,046	35,890	8,014	5,000	-27.3	-67.6	323,600	48.5
ALT3	4,976	121,126	66,929	53,646	9,400	233,055	35,890	8,014	5,000	-19.3	-60.5	323,900	48.6
Groundwater Remediation/ Reuse Operations													
ALT2b	4,976	121,126	52,357	73,784	0	253,225	35,890	8,014	0	-34.5	-75.3	322,500	44.5
ALT2c	4,976	121,126	52,357	55,758	18,800	235,173	35,890	8,014	5,000	-21.9	-61.8	323,900	48.6
ALT4a	28,418	37,816	6,566	59,751	N/A	248,563	0	0	N/A	-18.8	-69.2	319,200	40.8
ALT4b	28,418	37,816	6,566	59,751	N/A	248,554	18,664	8,201	N/A	-21.6	-70.6	318,800	40.7

Notes: Alternatives 1a, 1b, and 1c are existing plus project scenarios.
Alternatives 2a, 2b, 2c, and 3 are cumulative plus project scenarios.

AG WU = agricultural water use
Urban WU = urban water use
SW Supply = surface water supply
GW Supply = groundwater supply
msl = mean sea level
cfs = cubic feet per second
afy = acre-feet per year

[1] Surface water values for 2030 level conditions reduced by 894 afy to reflect Dry Year Demand for SMUD
[2] Does not include groundwater remediation pumping
[3] Flow enhancement of 5,000 afy equally distributed through September, October, and November Flow enhancement is not proposed as an element of the 2002 Zone 40 WSMP.
[4] Average monthly groundwater elevation of hydrograph H, J, T for the 74-year simulation period
[5] Average monthly groundwater elevation of hydrograph K, L, O, P for the 74-year simulation period

Source: WRIME 2003

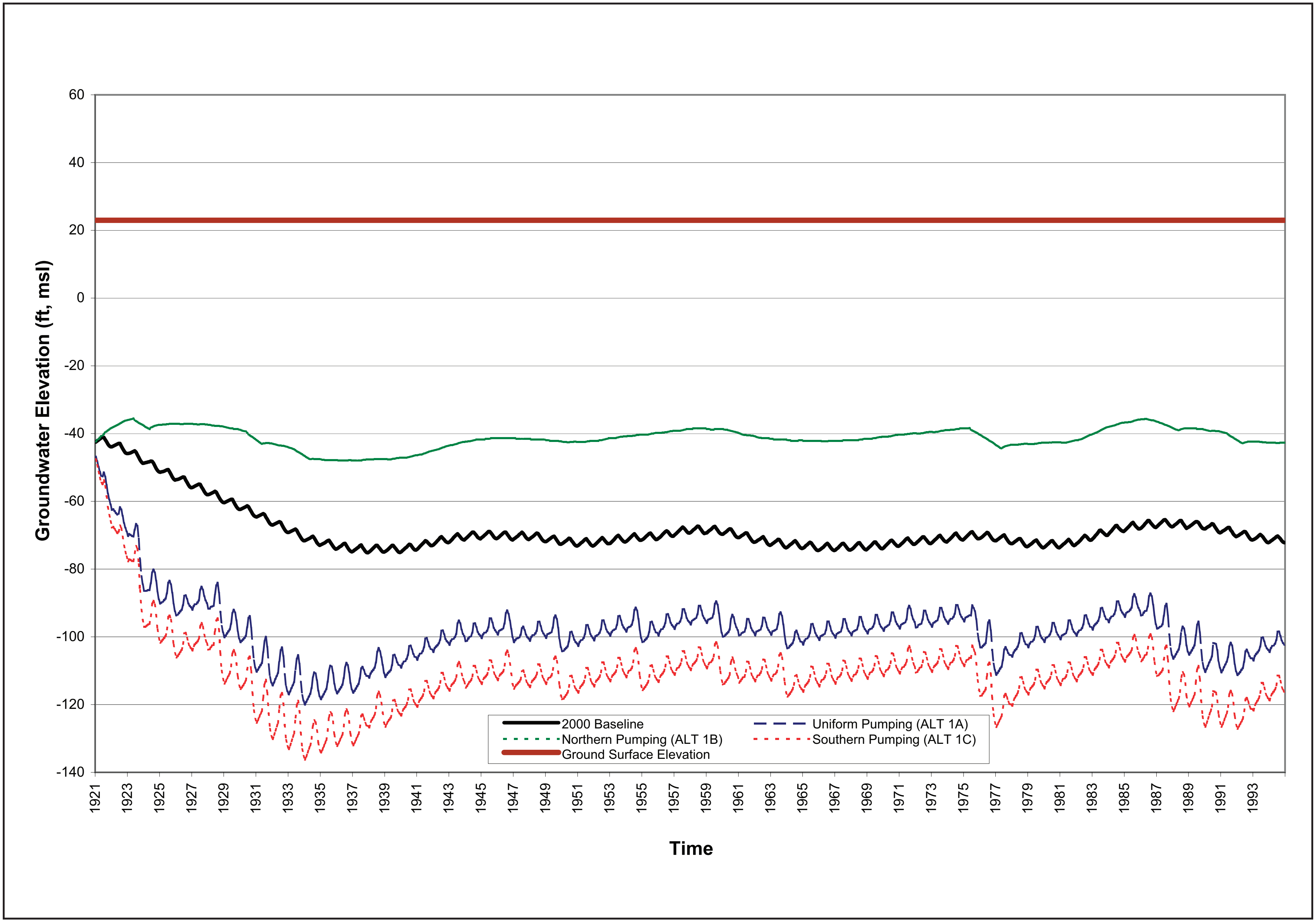


Source: EDAW 2003

Groundwater Hydrograph at Sunrise Area (Location I) for Zone 40 Groundwater Pumping Distribution Alternatives

EXHIBIT 4.7-7a

EDAW



Source: EDAW 2003

Groundwater Hydrograph at Central Area Groundwater Depression (Location K) for Zone 40 Groundwater Pumping Distribution Alternatives

EXHIBIT 4.7-7b

2002 Zone 40 Water Supply Master Plan EIR
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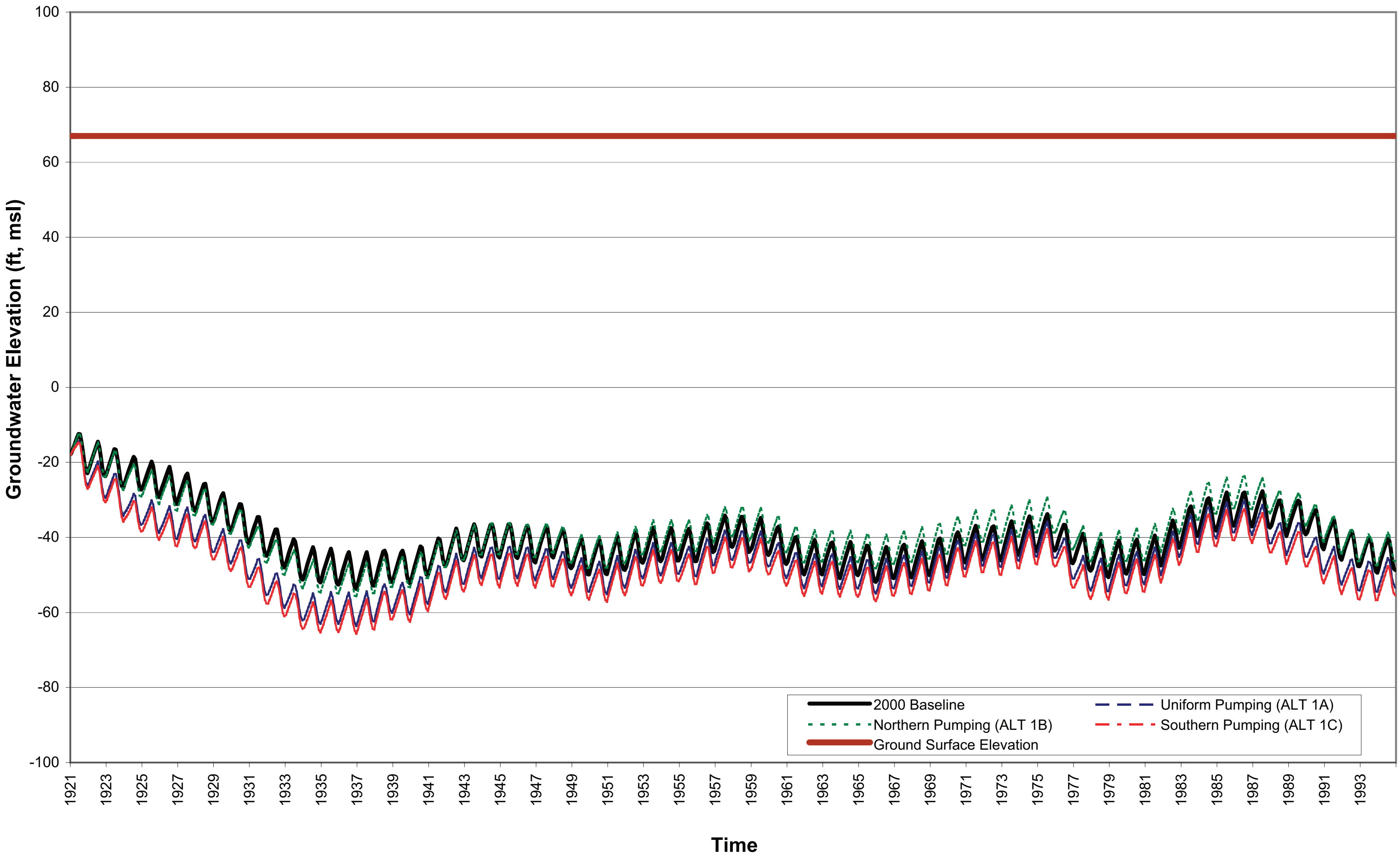

Source: EDAW 2003

Groundwater Hydrograph at Middle of Cosumnes River (Location U) for Zone 40 Groundwater Pumping Distribution Alternatives

EXHIBIT 4.7-7c

2002 Zone 40 Water Supply Master Plan EIR

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Water Supply Availability Alternatives

Two model runs were conducted to determine the effects of variable surface water supply and potential enhancement of Cosumnes River flows. Each assumes a uniform pumping distribution, extraction of nearly 36,000 afy for groundwater remediation, 50% reuse of remediated groundwater and reinjection of approximately 8,000 afy, and transfer 5,000 afy to the Cosumnes River. The first of these alternatives (Alternative 2a) assumes only firm surface water supplies of approximately 52,400 afy to address the uncertainty of other water supply options. The second (Alternative 3) assumes additional appropriative supplies of approximately 14,600 afy, for a total of about 67,000 afy.

Average groundwater levels in northern and southern Zone 40 with firm supplies only (Alternative 2a) would be approximately 2 and 7 feet lower than the 2030 Baseline Condition (see Table 4.7-2). However, average groundwater levels with additional appropriative water (Alternative 3) would be approximately 6 feet higher in the northern Zone 40, and almost the same in the southern Zone 40 area. The details of changes in groundwater levels in various parts of Zone 40 can be seen in the groundwater level hydrographs presented in Appendix F, Hydrologic and Modeling Analysis for the Zone 40 Water Supply Master Plan.

Groundwater Remediation and Reuse Alternatives

To isolate the effects of groundwater remediation and reuse in Zone 40 additional model runs were conducted that consider: 2030 Conditions with no reuse of the Aerojet remediation pumping (Alternative 2b, and therefore no Cosumnes River flow enhancement); 2030 Conditions with complete reuse of the Aerojet remediation pumping (including the Cosumnes River flow enhancement [Alternative 2c]); 2000 Baseline with no remediation pumping (Alternative 4a); and 2000 Baseline with reinjection of 50% of the Aerojet remediation pumping (Alternative 4b).

The effects of 50% reuse, no reuse, and complete reuse of remediated groundwater are presented in the summary Table 4.7-2, and in the hydrographs presented in Appendix F. Based on the summary table, if the 50% reuse option is implemented, the average groundwater levels would be lower than the 2030 Baseline by about 2 to 7 feet. If no reuse option is implemented (Alternative 2b), average groundwater levels would be approximately 9 to14 feet lower. However, if the reuse of remediated groundwater is increased to the full level, the average groundwater levels in northern Zone 40 would increase by about 4 feet from import of surface water, while those in the southern Zone 40 area would decrease by about 1 foot.

IMPACT ANALYSIS

Impact 4.7-1: Deliveries to SWP and CVP Customers. Proposed surface water diversions at Freeport would reduce annual average SWP and CVP south-of-Delta deliveries by 6,000 af and 4,000 af, respectively, compared to no-project conditions. This represents about a 0.2% decrease in annual average deliveries. This degree of change is too small to alter water supply management actions by south-of-Delta water agencies, so post-project conditions would not result in significant impacts.

Changes in south-of-Delta SWP and CVP deliveries were analyzed in the Freeport Draft EIR/EIS at page 3-15 through 3-16. The relatively small project-related diversions (SCWA plus EBMUD) compared to Delta export operations would not cause substantial changes in deliveries and no discernible difference is observed in the frequency distribution comparing the base- and base-plus-project condition (Figure 3-12 at page 3-16 of the Freeport Draft EIR/EIS). Implementation of the project would reduce annual average SWP and CVP south-of-Delta deliveries by 6,000 af and 4,000 af respectively compared to no-project conditions. Relative to the total south-of-Delta deliveries, the changes represent about a 0.2% reduction to each. Post-project conditions would be essentially the same as existing conditions, so this would be a less-than-significant effect on water supply south of the Delta.

Impact 4.7-2: Operational Effects during Reverse Flow in the Sacramento River. Diversion of water at the Freeport intake during low flow and reverse flow conditions would reduce the volume of water available to dilute effluent discharged at the SRWWTP, requiring the plant to suspend discharge and store effluent for additional periods, and would potentially cause diluted effluent to be diverted at the Freeport facility. Modeling and analysis indicate that operation of the Freeport diversion would reduce Sacramento River flow by 112 cfs on average and by 88 cfs during low-flow periods. This reduction in flow would require SRWWTP to extend effluent storage by an estimated 2 minutes. Modeling also shows that the maximum quantity of effluent potentially entrained by Freeport diversions under most likely conditions would be very small (less than 3%) and would occur for the short period of a few hours (less than 4 hours) at the most. FRWA and SRCSD would coordinate operations with automated streamflow monitoring equipment, so that Freeport diversions would neither trigger effluent storage when it would not otherwise be necessary, nor cause SRWWTP to exceed effluent storage capacity. Water would not be diverted at the intake facility during peak higher high-tide or during extreme low-flow/high-tide events, if there is potential to divert water that may contain treated wastewater, or exacerbate water quality concerns associated with reverse flow conditions. Because the SRCSD and FRWA have agreed to coordinate operating to minimize potential conflicts with diversions of Sacramento River water and discharge of treated wastewater, water quality effects would be less than significant.

Impacts of project operation during reverse flow events in the Sacramento River are assessed in the Freeport Draft EIR/EIS at page 4-15 through 4-16. Flow in the Sacramento River up to the confluence of the American River is tidally influenced. This effect is greatest during the dry summer months when downstream flow of the Sacramento River is low. The peak of a higher high tide in combination with Sacramento River flow rates of less than 10,000 cfs can result in reverse flow events in the river (i.e., incoming tide that pushes water upstream) that may cause diluted discharges from SRWWTP to travel upstream, possibly as far as the intake facility. Diversion of water from the Freeport intake facility during low flow conditions could result in two types of operational effects. First, it could reduce the volume of water available to dilute effluent from the SRWWTP, causing the need for additional periods of effluent storage in accordance with the plant's discharge requirements; second, it could cause diluted effluent to be diverted at the Freeport facility for short periods of time.

SRWWTP is required to cease effluent discharge and store it when a dilution ratio is less than 14:1 (volume of river water to effluent). Modeling and analysis in the Freeport Draft EIR/EIS shows that operation of the diversion would reduce flow in the Sacramento River immediately upstream of the SRWWTP outfall by 112 cfs on average, and by 88 cfs during low-flow conditions of 10,000 cfs or less. It is estimated that reducing river flow by this amount would extend by approximately 2 minutes the duration of the period when effluent discharge to the river must be suspended. This suspension of discharge would be less than significant because it would not substantially affect treatment plant operation.

When monthly average Sacramento River flow is less than about 7,000 cfs, which occurs infrequently, tidally induced reverse flows can be large enough to result in the upstream reverse transport of treated SRWWTP wastewater effluent to beyond the Freeport intake facility. Modeling of two worst-case reverse flow conditions in the river (i.e., largest magnitude reverse flow condition, longest duration reverse flow condition) was conducted to evaluate the potential interaction of SRWWTP effluent discharge operations and FRWP diversions. The modeling results indicate that continuous Freeport diversion during these conditions could result in SRWWTP effluent being entrained in the Freeport diversions for short periods of time. The potential for FRWP diversions to contain diluted treated wastewater is a public perception concern regarding the quality of the water supply and is not an environmental impact. The maximum quantity of effluent potentially entrained by Freeport diversions under most likely conditions would be very small (less than 3%) and would occur for a short period of a few hours (less than 4 hours), even if the intake were operated continuously during the most severe reverse flow events. Existing water diversions from the Delta used for municipal water supplies generally contain some fraction of treated wastewater from the many municipalities that utilize Delta and upstream receiving waters as a component of their wastewater treatment systems. Municipal water is required to meet drinking water quality standards, regardless of whether some diluted effluent is entrained in diverted water.

Low river flows combined with high tides that cause large reverse flows occur relatively infrequently based on historical streamflow patterns, so it is feasible to manage diversions to avoid entraining diluted effluent. In addition, as described in Chapter 2, Project Description-Environmental Commitments, FRWA and SRCSD, operator of the SRWWTP, would coordinate their operations with automated streamflow monitoring equipment so that Freeport diversions would neither trigger effluent storage when it would not otherwise be necessary, nor cause SRWWTP to exceed effluent storage capacity. The intake facility would also not divert water during the few hours of the peak higher high-tide during extreme low-flow/high-tide events, if there is potential to divert water that may contain treated wastewater, or exacerbate water quality concerns associated with reverse flow conditions. This would be a less-than-significant impact.

Impact 4.7-3: Operational Water Quality Effects in the Sacramento River Downstream of Diversion. Diversion of water at the Freeport intake would incrementally reduce flow in the Sacramento River, reducing capacity for dilution of SRWWTP effluent discharges and other downstream discharges. Indirect effects of residential and commercial growth resulting from the additional water supplies would result in generation of additional wastewater to be treated at SRWWTP, increasing quantities of typical contaminants to the river associated with wastewater, including inorganic salts, nutrients (e.g., nitrogen and phosphorus), and trace inorganic and organic constituents. Modeling shows that the combination of reduced background river flows (direct effect) and additional wastewater flows from induced growth (indirect effect) would reduce the effective dilution ratio by about 2.3% under long-term average monthly river flow, and about 4.6% under the single lowest average monthly river flow. Flow reduction as a result of water diversion would constitute a small fraction of background river flow and only slightly reduce dilution of SRWWTP discharges under typical conditions. Because dilution capacity would not change substantially with or without the project, and SRWWTP would adhere to a minimum river to effluent dilution ratio of 14:1, operational water quality impacts on downstream flows of the Sacramento River would be less than significant.

Impacts of project operation on water quality in the Sacramento River downstream of the diversion are assessed in the Freeport Draft EIR/EIS at page 4-17 through 4-18. Freeport diversions from the Sacramento River could affect water quality conditions in the Sacramento River downstream of the SRWWTP effluent discharge outfall as a result of two influences. First, Freeport diversions would incrementally reduce the background streamflow in the Sacramento River and thereby directly reduce the quantity of dilution water in the river for assimilation of contaminants associated with the SRWWTP effluent discharges and other downstream discharges. Second, the future production of additional wastewater return flows to the Sacramento River via the SRWWTP resulting from SCWA's diversion and distribution of water for new residential and commercial developments in central Sacramento County supported by the 2002 Zone 40 WSMP would increase wastewater generation to the SRWWTP, resulting in additional quantities of typical contaminants to the river associated with wastewater, including inorganic salts, nutrients (e.g., nitrogen and phosphorus), and trace inorganic and organic constituents.

The combination of EBMUD and SCWA diversions would reduce flow in the Sacramento River up to the maximum peak rate of diversion (i.e., 185 mgd or 286 cfs). When only SCWA is operating the intake facility, Sacramento River flows would be reduced by up to a maximum of 85 mgd (132 cfs).

Less background streamflow in the Sacramento River would reduce the effective dilution for SRWWTP discharges and other downstream waste dischargers. The potential water quality changes in the Sacramento River resulting from reduced available dilution in the river would be negligible because the rates of project-related diversions are very small relative to background streamflow in the river. At most times of the year the peak diversion rate of 185 mgd (286 cfs) would constitute a small fraction of background river flow and only slightly reduce dilution of SRWWTP discharges under typical conditions. Modeling conducted for the Freeport Draft EIR/EIS shows that the combination of reduced background river flows and additional wastewater return flows would reduce the effective dilution ratio by about 2.3% under long-term average monthly river flow, and about 4.6% under the single lowest average monthly river flow.

With regard to indirect effects of increased wastewater generation, assuming wastewater return flows are about 60% of domestic consumption, approximately 51 mgd (78 cfs) of increased SRWWTP discharges would be produced from new development supported by project-related deliveries. The SRWWTP is currently permitted for a daily average dry-weather flow rate of 181 mgd, and the actual discharge averages 154 mgd. The SRCSD is currently preparing a Master Plan for SRWWTP expansion and facility upgrades that are needed to provide plant capacity for projected inflows through the year 2020 of about 218 mgd.

The indirect water quality impacts associated with future increased SRWWTP effluent discharges resulting from SCWA deliveries of water to central Sacramento County would be small, and SRWWTP operations would not be significantly affected because SRCSD is planning for growth accommodated by the Zone 40 WSMP to the year 2020, and a new process would be initiated to plan for growth beyond 2020. As noted above, SRWWTP discharge is curtailed when the background river flows provide less than a 14:1 dilution ratio and these operations would not change. Therefore, there would be no substantial difference in river water quality conditions during low-flow conditions because the 14:1 dilution ratio would be maintained. Future specific water quality conditions in the Sacramento River cannot be predicted; however, the quality of SRWWTP effluent discharges would not change substantially following construction of expanded treatment plant facilities (SRCSD 2003). The SRCSD would be required to continue to meet regulatory water quality objectives for its discharge. Operational water quality impacts on the Sacramento River would be less than significant.

Impact 4.7-4: Operational Effects on Delta Water Quality. Diversion of surface water from the Sacramento River would slightly reduce the volume of fresh water flowing to the Delta. Modeling results showed that the reduced freshwater flow would change the position of X2, a contour line of a specific salinity concentration used as an indicator of water quality in the western Delta. Average chloride concentrations were modeled at key Delta water diversion locations and were found to increase by up to 0.5 milligrams per liter (mg/l) at each location compared to background average concentrations that range from 67 mg/l to 78 mg/l. Post-project water quality at these locations would be essentially the same as existing conditions. Operational water quality impacts on Delta water quality would be less than significant.

Impacts of project operation on Delta water quality are assessed in the Freeport Draft EIR/EIS at page 4-24 through 4-28. Modeling conducted for the Freeport Draft EIR/EIS shows that water diverted at the Freeport intake facility would slightly reduce total average freshwater flow to the Delta. However, the reduced flow resulted in no project-related change in the X2 position value, a significant indicator of water quality in the western Delta. X2 is a contour line of a specific salinity concentration which, when it reaches specific upstream locations triggers the need for freshwater releases from upstream reservoirs to ensure acceptable water quality in the Sacramento River and Delta. Changes in Delta hydrology result in changes in Delta salinity variables simulated with project modeling methods. Changes in chloride concentrations were modeled at key Delta locations (Rock Slough, Old River at Highway 4, West Canal near the Clifton Court Forebay, and the Delta-Mendota Canal (DMC) at the Tracy Pumping Plant and average concentrations were found to range from 0.2 mg/l to 0.5 mg/l at each location compared to background average concentrations that range from 67 mg/l to 78 mg/l. Post-project water quality at these locations would be essentially the same and impacts would be less than significant.

Impact 4.7-5: Potential Contaminant Discharge during Construction. Construction of project facilities would involve the use of substances, such as fuels, oils, concrete, and other materials, that are harmful if released to the aquatic environment, and soil-disturbing activities that could result in erosion and contribution of sediment to surface waters. Because FRWA, SCWA, and their contractors would obtain all necessary state and local permits and clearances necessary for construction, and implement appropriate Best Management Practices (BMPs) to protect surface waters from contamination, construction-related water quality impacts would be less than significant.

Impacts of potential contaminant discharge during construction of the diversion facility in the Sacramento River and buried pipelines from the diversion facility to Zone 40 are assessed in the Freeport Draft EIR/EIS at page 4-14 through 4-15. Extensive construction activities would be required to construct the facilities and have the potential to result in short-term water quality impacts from exposure to winter storms and stormwater runoff. Activities that could result in such impacts include vegetation clearing and grubbing operations, sediment removal or disturbance, grading and excavation, stockpiling of soils, cofferdam and sheet pile installation, and other activities. Large construction sites typically contain substances, such as fuels, oils, concrete, and other materials, that are harmful if released to the aquatic environment. Construction of facilities required for the recycled and groundwater components of the project (wells, treatment, storage, pumping, and conveyance) would also involve soil-disturbing activities and use of materials that could be harmful to surface waters, but these facilities are expected to be constructed away from surface waters and would have little potential for impact.

As described in Chapter 2, Project Description-Environmental Commitments of the Freeport Draft EIR/EIS (pages 2-44 through 2-51), FRWA and its contractors would obtain all necessary local permits, clearances, and National Pollutant Discharge Elimination System (NPDES) permits or other Waste Discharge Requirements (WDRs) from the Regional Water Quality Control Board (RWQCB), and implement appropriate Best Management Practices (BMPs) to protect surface waters from contamination. SCWA and its contractors would similarly secure such permits and implement BMPs for portions of the project related to the recycled water and groundwater facilities. Impacts related to potential contaminant discharge during construction would be less than significant.

Impact 4.7-6: Groundwater Elevation and Consistency with Water Forum Sustainable Yield. In 2030, approximately 74,000 afy of groundwater is expected to be pumped by SCWA and private urban and agricultural water users for use in the Zone 40 Study Area. This volume, combined with other pumping in the Central Basin (including pumping for groundwater remediation) would be below the Water Forum sustainable yield recommendation of 273,000 afy for all modeled scenarios except 2b, in which no reuse of remediated groundwater is assumed. Recent agreements between Sacramento County, SCWA, and Aerojet/McDonnell Douglas suggest that some reuse of the water would occur. The agreements are included as Appendix G. Stabilized groundwater elevations at the Central Basin cone of depression under the modeled scenarios would range from approximately -50 feet msl to -85 feet msl (including Alternative 2b), which are all substantially higher than the Water Forum projected level of -116 to -130 feet msl. Because groundwater pumping associated with the 2002 Zone 40 WSMP would not cause sustainable yield recommendations to be exceeded except under an unlikely cumulative scenario, and groundwater levels at the Central Basin cone of depression are projected to be higher than those determined to be acceptable to the Water Forum, this impact would be less than significant.

Groundwater modeling conducted for the 2002 Zone 40 WSMP considers scenarios that include variable pumping locations; variable surface water supplies (future firm surface water supplies and one scenario that includes additional appropriative water); and existing and future groundwater remediation pumping with various levels of reuse, reinjection, and enhancement of Cosumnes River flows. With the exception of Alternative 2b, which assumes no reuse of remediated water from Aerojet and total loss of approximately 36,000 af to the basin (a highly unlikely condition), all scenarios would result in total groundwater pumping that is below the sustainable yield recommendations of the WFA. As Alternative 2b includes pumping that is outside the scope of the project (i.e., pumping of contaminated groundwater for remediation purposes and pumping outside of Zone 40), this impact is also addressed in Section 6, Cumulative Impacts.

In 2030, approximately 74,000 afy of groundwater is expected to be pumped by SCWA and private urban and agricultural water users for use in the Zone 40 Study Area. This pumping would contribute to overall groundwater use in the Central Basin and incremental lowering of groundwater levels.

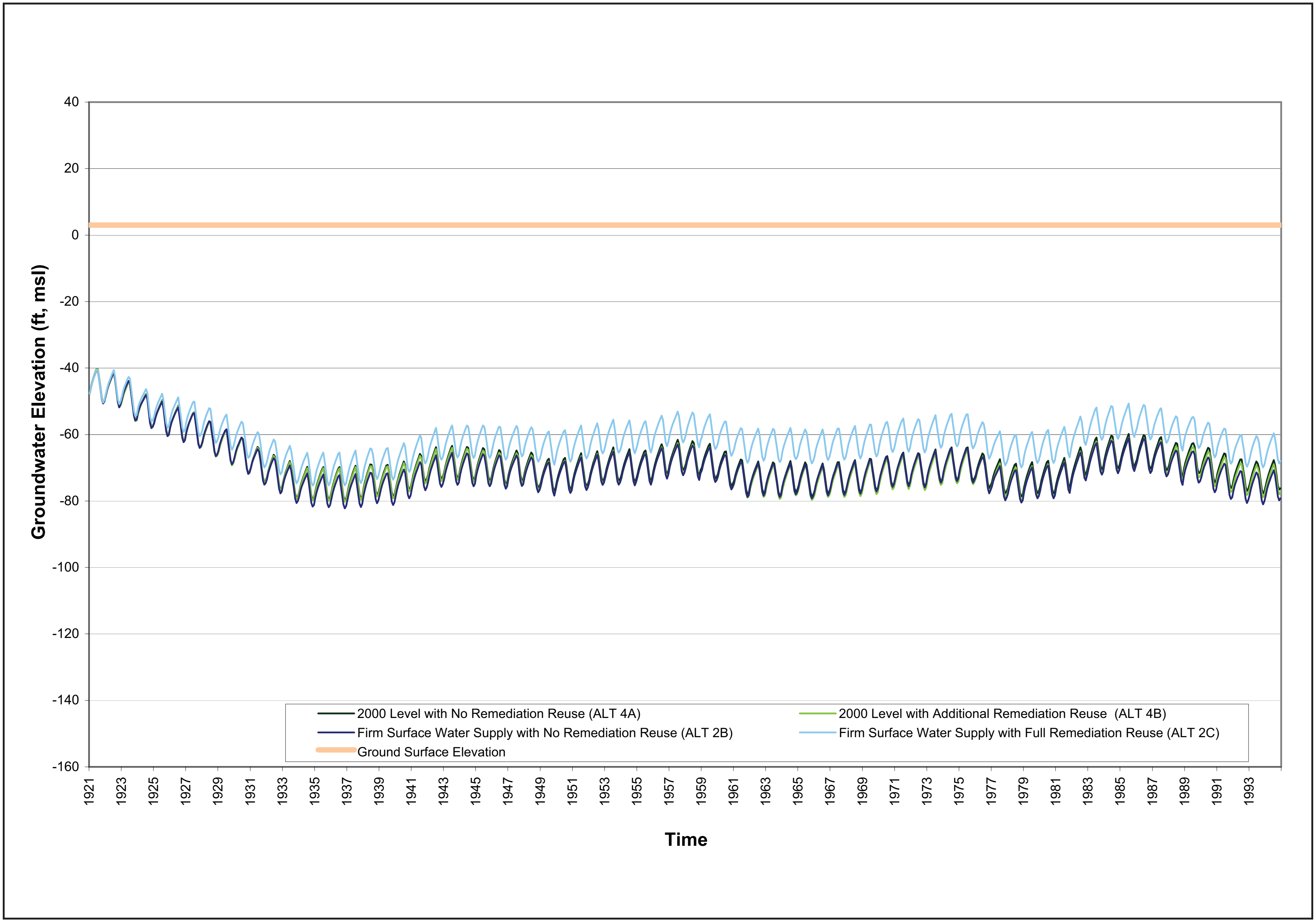
A key indicator of compliance with the Water Forum recommended sustainable yield is the groundwater elevation at the Central Basin cone of depression. Under the Water Forum recommended sustainable yield, groundwater was projected to stabilize at an elevation of -116 to -130 feet msl at the lowest level within the cone of depression (see the Groundwater Methodology section above for a discussion of differences in method and results between the Water Forum and 2002 WSMP modeling). Modeling conducted for the 2002 Zone 40 WSMP shows that, with firm surface water supplies only and uniform pumping within Zone 40 (Alternative 1a), groundwater elevation at the cone of depression would stabilize at about -80 feet msl. Northern (Alternative 1b) and southern (Alternative 1c) pumping scenarios would result in stabilization at about -50 feet msl and -85 feet msl, respectively (see Exhibit 4.7-7b). These levels are on the order of 30 to 70 feet higher than those deemed acceptable by the Water Forum; 5 to 40 feet higher than the 2000 Baseline; and 10 feet higher to 25 feet lower than spring 2000 levels.

Alternative 2b includes cumulative groundwater pumping outside Zone 40, 2030 levels of remediation pumping, and no reuse of the remediated water. Because Sacramento County, SCWA, and Aerojet/McDonnell Douglas recently reached agreement regarding the reuse of the remediated water, this scenario is considered highly unlikely. Under these conditions, although total groundwater pumping is projected to exceed the Water Forum-recommended sustainable yield by approximately 16,000 afy, groundwater elevation at the Central Basin cone of depression is expected to stabilize at -70 feet msl, about 46 to 60 feet higher than the Water Forum-projected level (Exhibit 4.7-8). If SCWA receives anticipated appropriative water (Alternative 3), groundwater at the cone of depression would stabilize at a level 10 feet higher, at -60 feet msl (Exhibit 4.7-9).

Because groundwater pumping associated with the 2002 Zone 40 WSMP would not cause sustainable yield recommendations to be exceeded except under an unlikely cumulative scenario, and groundwater levels at the Central Basin cone of depression are projected to remain at levels substantially higher than those accepted by the Water Forum, this impact would be less than significant.

Impact 4.7-7: Hydrologic Impacts on the Cosumnes River. Groundwater pumping for water supply in 2030 associated with the 2002 Zone 40 WSMP could range from about 54,000 to 74,000 afy, as compared to a 2000 Baseline level of about 60,000 afy. Modeling shows that Cosumnes River flows would be virtually unchanged as a result of the 2002 WSMP, as would average annual Cosumnes River flow volume and average fall flows (September through November). Similarly, modeling showed virtually no change in Cosumnes River flow under cumulative scenarios, as compared to the 2000 Baseline. Consequently, the 2002 Zone 40 WSMP would not adversely change the duration, timing, or frequency of periods when surface flow in the Cosumnes River would occur. This would be a less-than-significant impact.

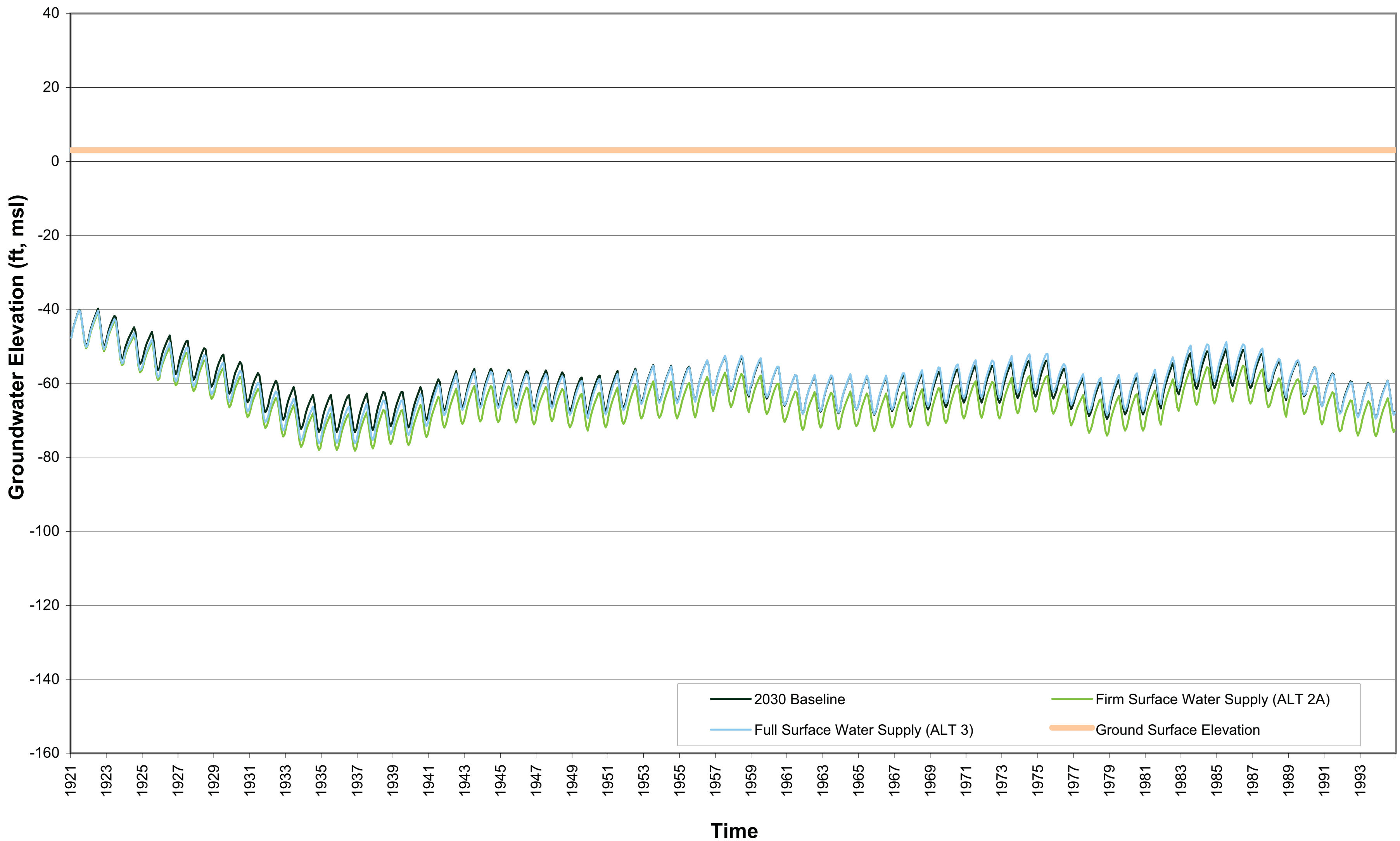
The U.S. Geological Survey maintains gaging stations on the Cosumnes River at Michigan Bar, above the Folsom South Canal, and at McConnell, near State Route 99. Based on a period of record from 1908 through 2002, mean monthly flow at Michigan Bar ranges from a high of nearly 1,200 cfs in February and March, to a low of about 15 cfs in September. Mean monthly flow at Michigan Bar during September, October, and November (the critical period for migrating Chinook salmon [see Section 4.6, Biological Resources]) is 15 cfs, 31 cfs, and 138 cfs, respectively.



Source: WRIME 2003

Groundwater Hydrograph at Central Area Groundwater Depression (Location O) for Alternatives 4A, 4B, 2B, and 2C Conditions

EXHIBIT 4.7-8



Source: WRIME 2003

Groundwater Hydrograph at Central Area Groundwater Depression (Location O) for 2030 Baseline, Alternative 2A, and Alternative 3 Conditions

EXHIBIT 4.7-9

Based on a period of record from 1941 through 1982, mean monthly flow at McConnell ranges from a high of about 1,200 cfs in March, to a low of about 3 cfs in September. Mean monthly flow at McConnell during September, October, and November is 3 cfs, 21 cfs, and 170 cfs, respectively.

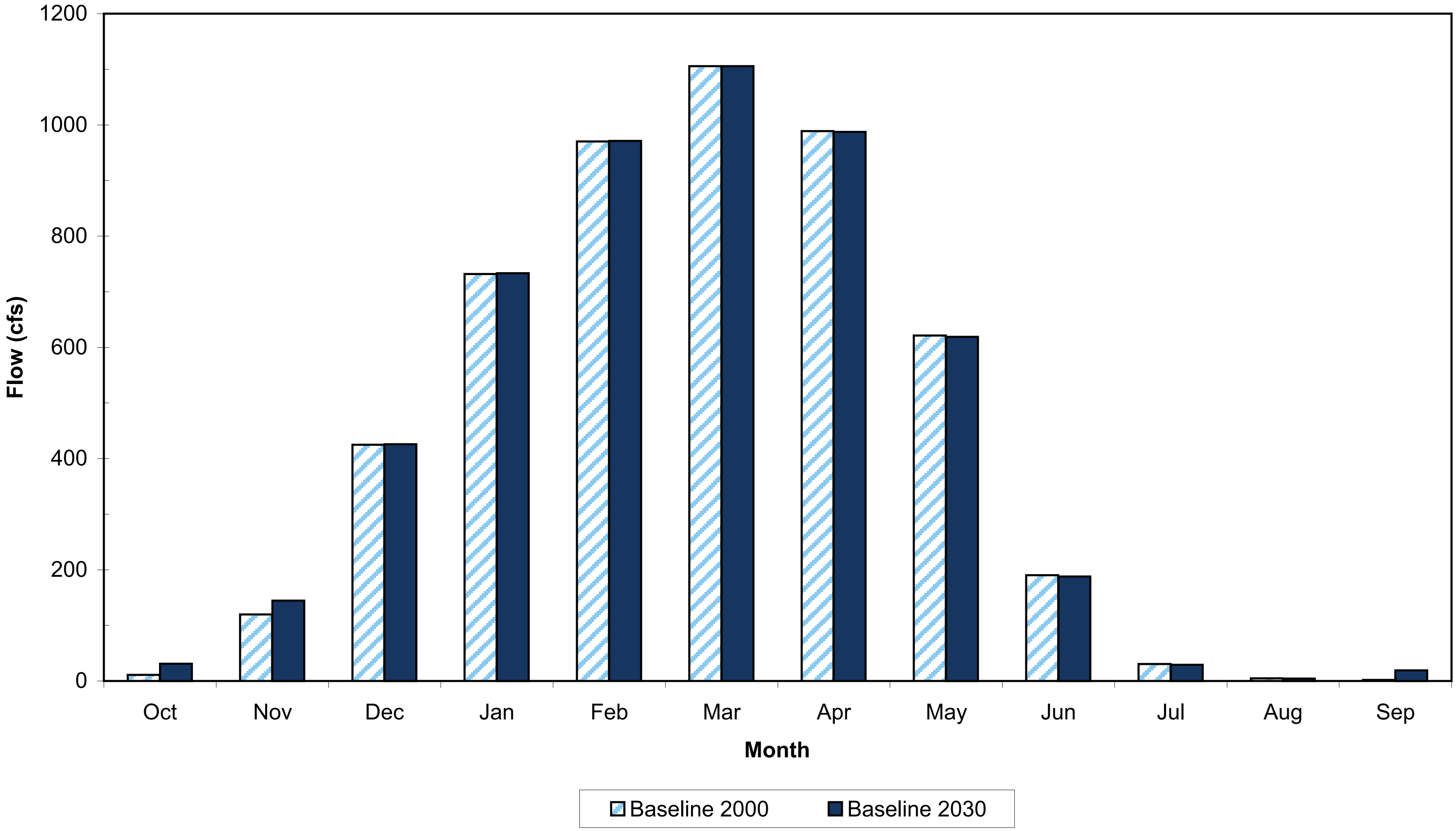
Simulated flows for the 2000 Baseline Condition at Folsom South Canal (between Michigan Bar and McConnell, near State Route 99) are similar to measured flows, ranging from a high of just over 1,100 cfs in March to near zero in August and September (Exhibit 4.7-10).

It is important to note that measured flows at Michigan Bar include data from early in the last century prior to extensive levee construction, agricultural operations, and associated surface water diversions and groundwater pumping that have lowered river flows in recent decades. Similarly, measurements at McConnell include records from 1941, prior to additional flood control efforts and expanded urban and agricultural land uses. In contrast, the 2000 Baseline assumes the 2000 level of development and groundwater pumping held constant over the 74-year period of record.

Implementation of the 2002 Zone 40 WSMP could result in slightly reduced groundwater pumping within Zone 40 for urban and agricultural uses (assuming availability of remediated and appropriative water in addition to firm surface water supplies) as compared to the 2000 Baseline, or could result in increased groundwater pumping from a 2000 Baseline level of about 60,000 afy to about 74,000 afy (assuming no availability of remediated and appropriative water).

Modeling conducted for alternative pumping locations (Alternatives 1a, 1b, and 1c) shows that average annual Cosumnes River flow and average fall flows (September through November) at State Route 99 are virtually unchanged from 2000 Baseline to post-project conditions (see Table 4.7-2). Annual flow increases slightly from 318,800 af under the 2000 Baseline to just over 319,000 af under the alternatives. Simulated average fall flows for the September through November period are essentially unchanged at approximately 40.7 cfs for the 2000 Baseline and 41.0 or 41.1 cfs for the alternatives. Modeled stream hydrographs along the Cosumnes River at Michigan Bar, Folsom South Canal, State Route 99, and Twin Cities Road (see Appendix F, Figures B.25, B.26, B.27, and B.28) show no difference in flow over time for the different pumping distribution alternatives as compared to the 2000 Baseline. Impacts of the 2002 Zone 40 WSMP on surface flows of the Cosumnes River would be less than significant.

Under the 2030 Baseline and cumulative scenarios considered (i.e., various surface water supply availability, groundwater remediation and reuse alternatives), groundwater pumping for water supply in Zone 40 would range from a low of about 54,000 afy under Alternative 3 (with appropriative water and some reuse of remediated water) to a high of about 74,000 afy under Alternative 2b (no appropriative water and no reuse of remediated water). Again, modeling shows average annual Cosumnes River flow and average fall flows (September through November) at State Route 99 to be virtually unchanged from 2000 Baseline to post-project conditions under each of the future scenarios (see Table 4.7-2). Annual flow ranges



Source: WRIME 2003

Simulated Cosumnes River Average Flow Near Folsom South Canal Crossing

EXHIBIT 4.7-10

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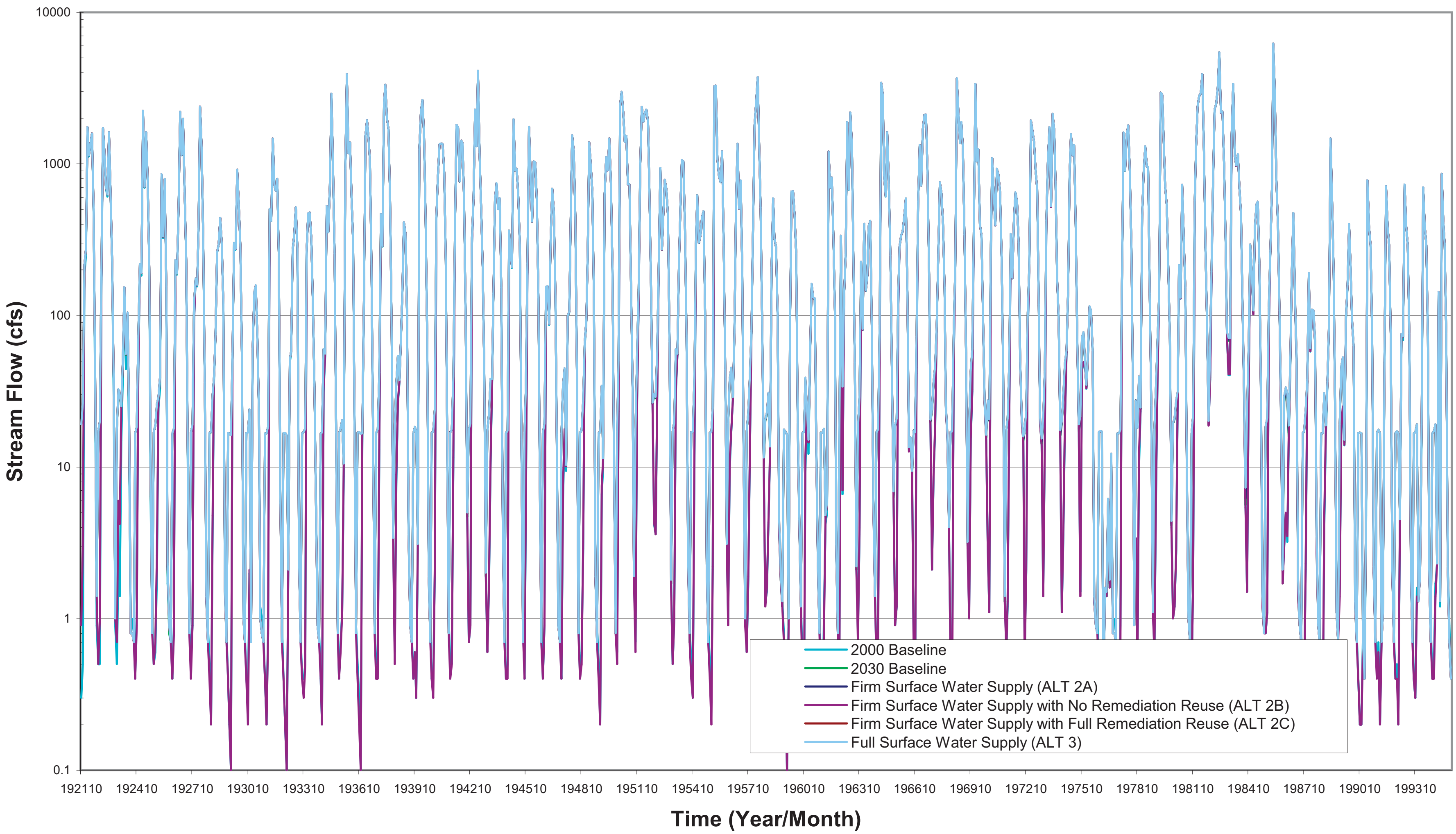
from a low of 322,500 af (Alternative 2b) to a high of 323,900 af (Alternative 3), compared to the 2000 Baseline of 318,800 af. Average fall flows for the September through November period range from 44.5 cfs (Alternative 2b) to 48.6 cfs (Alternatives 2c and 3), compared to the 2000 Baseline average of 40.7. The important difference in this fall flow comparison is that all 2030 scenarios (including the 2030 Baseline) except Alternative 2b were assumed to include a 5,000 afy (1,666 af per month) flow enhancement to the Cosumnes River. While the flow enhancement is not proposed as an element of the 2002 WSMP, SCWA is interested in understanding the degree of beneficial effect of such enhancement in the context of the project. Simulated average fall flows of 44.5 cfs for Alternative 2b (which does not include flow enhancement) are lower than other 2030 scenarios, but are nearly 4 cfs higher than those of the 2000 Baseline (40.7 cfs), reflective of additional surface water supplies to the region.

Modeled stream hydrographs along the Cosumnes River at Folsom South Canal, State Route 99, and Twin Cities Road show virtually no difference in flow over time for the different cumulative scenarios (water supply availability and remediation/reuse alternatives) as compared to the 2000 Baseline (Exhibits 4.7-11, 4.7-12, and 4.7-13). Cumulative impacts would be less than significant.

Impact 4.7-8: Groundwater Quality. Implementing the 2002 Zone 40 WSMP would result in groundwater elevations that are generally higher than the 2000 Baseline condition and, depending upon pumping distribution and localized groundwater conditions, higher or lower than spring 2000 levels. Lowering of groundwater could result in deterioration of groundwater quality in some areas of the Central Basin because of uprising of poorer quality water from the lower aquifer zone. In the future, elevated manganese and iron levels may occur in groundwater but at levels that would represent an aesthetic, rather than health-related impact. Continued treatment of manganese and iron is expected for municipal wells in the future. Additionally, arsenic levels are not anticipated to exceed Title 22 standards. This would be a less-than-significant impact.

Implementation of the 2002 Zone 40 WSMP would result in groundwater elevations that are generally higher than the 2000 Baseline condition and, depending upon pumping distribution, higher or lower than the spring 2000 condition. Groundwater quality impacts associated with the lowering of groundwater elevations are assessed in the Water Forum EIR at pages 4.2-16 through 4.2-17. As described in Groundwater Methodology, the Water Forum EIR projected greater lowering of groundwater by 2030 than projected under the modeling for the 2002 Zone 40 WSMP because of refinements to the Sacramento County IGSM, assumptions, and methodology. Lowering of groundwater levels in the Central Basin is associated with the uprising of poorer quality water from the lower aquifer zone which then mixes with the water of the shallow aquifer zone. Increases in average concentrations of both manganese and arsenic have been shown to correspond to groundwater declines of 80 feet or more from pre-development conditions. Using total groundwater decline of 80 feet from pre-development conditions as a threshold, modeling conducted for the WFA projected that approximately 67,720 acres (out of 278,515 acres) in the Central Area had the potential to

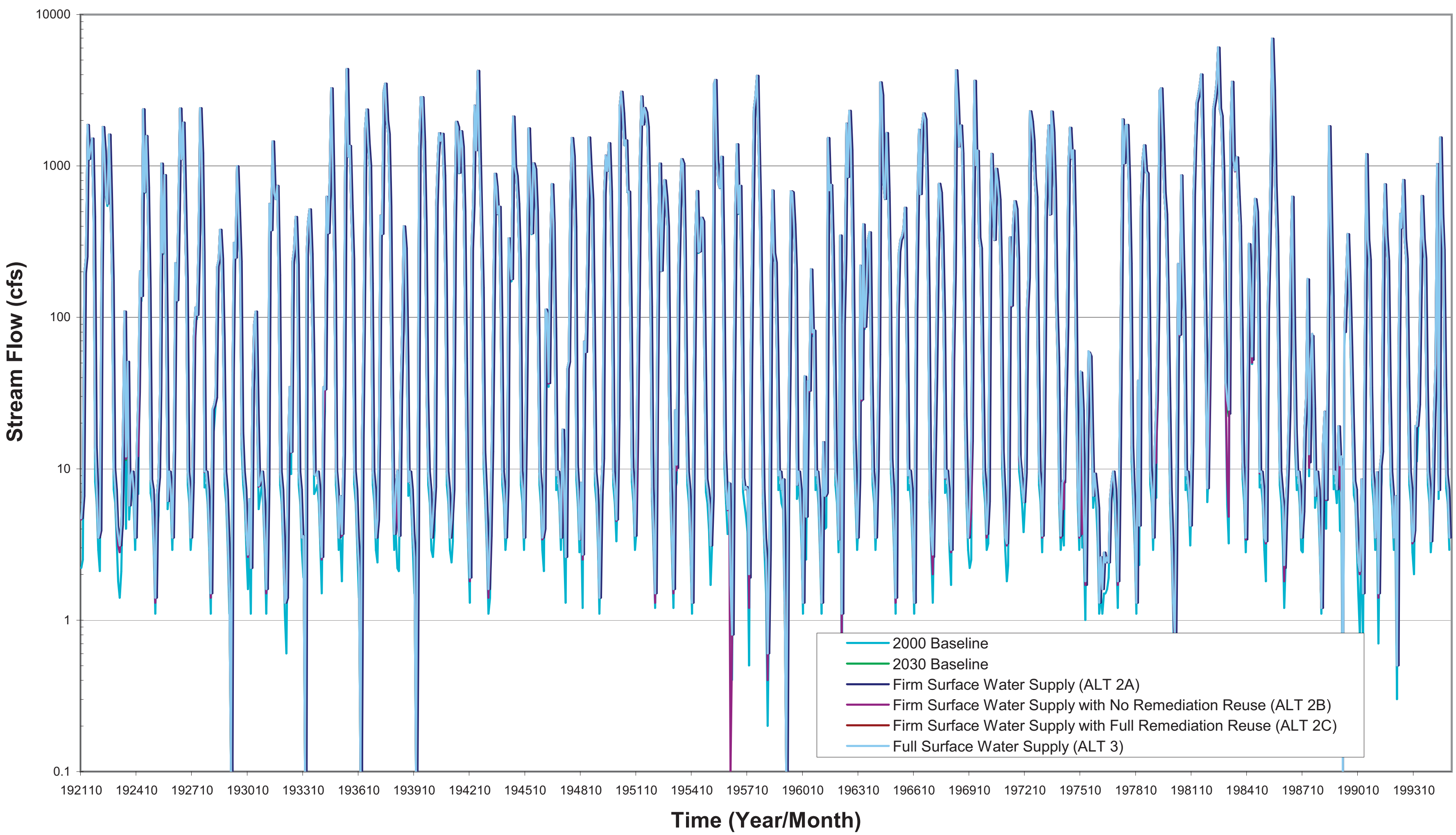


Source: WRIME 2003

Stream Hydrograph at Cosumnes River near Folsom South Canal (Location S4) for 2000 and 2030 Baseline and Alternatives 2A, 2B, 2C, and 3 Conditions

EXHIBIT 4.7-11

EDAW

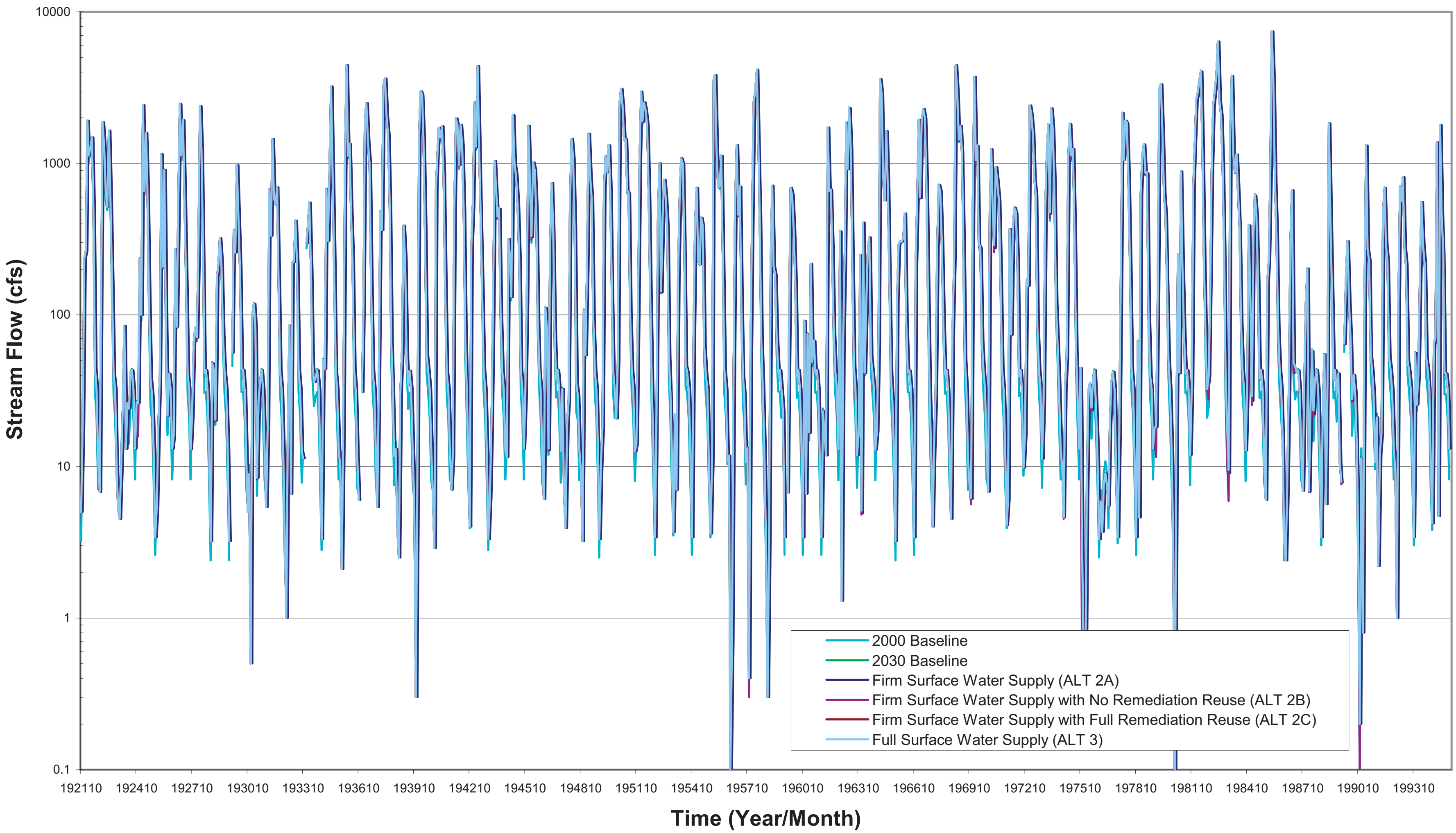


Source: WRIME 2003

Stream Hydrograph at Cosumnes River near State Route 99 (Location S5) for 2000 and 2030 Baseline and Alternatives 2A, 2B, 2C, and 3 Conditions

EXHIBIT 4.7-12

EDAW



Source: WRIME 2003

Stream Hydrograph at Cosumnes River near Twin Cities Road (Location S6) for 2000 and 2030 Baseline and Alternatives 2A, 2B, 2C, and 3 Conditions

EXHIBIT 4.7-13

EDAW

produce groundwater with elevated levels of manganese, arsenic, and/or iron. Because the Water Forum modeling projected greater lowering of groundwater elevation over a broader area, groundwater quality impacts of the Zone 40 WSMP would not be greater and likely would be much less.

Even at Water Forum-projected groundwater elevations, elevated levels of manganese and iron may occur in groundwater but at levels that would constitute an aesthetic, rather than health-related effect. Arsenic levels are not expected to exceed Title 22 standards. No standards for radon have yet been established. Impacts to groundwater quality would be less than significant.

Impact 4.7-9: Movement of Groundwater Contaminants. Implementing the 2002 Zone 40 WSMP would result in groundwater elevations that are generally higher than the 2000 Baseline condition and, depending upon pumping distribution and localized groundwater conditions, higher or lower than spring 2000 levels. Localized lowering would result in no substantial increase in the rate of groundwater contaminant movement. Current remediation efforts would continue and would increase over time. This would be a less-than-significant impact.

Movement of groundwater contaminants as a result of increase groundwater pumping is assessed in the Water Forum EIR at pages 4.2-17 through 4.2-19. As described, the current rate of lateral groundwater movement in the region is on the order of hundreds of feet per year. IGSM was used in the Water Forum assessment to provide a general projection of the migration rate and direction of nine known groundwater contaminant plumes. Results showed that the rate of groundwater movement at each of the sites increases with decline in groundwater levels. Based on groundwater decline projected for the Water Forum (which is greater than declines projected under recent modeling for the 2002 Zone 40 WSMP), rates of migration in the Central Area would range from 128 to 635 feet per year, and the increments resulting from the WFA would range from 1 to 86 feet per year, depending on location (see Table 4.2-4 of the Water Forum EIR). Any increases in migration rates, however, would not be instantaneous and would occur after groundwater levels have stabilized. As such, the increase in migration rates that may occur each year over 20 to 30 years would be less than 5 feet/year. As a result, no substantial increase in the rate of groundwater contaminant movement is expected.

Each of the contaminated sites is presently undergoing clean-up efforts, much of which includes the use of extraction wells in pump-and-treat programs. With remediation and future monitoring of clean-up efforts, the effects of contaminants on groundwater supplies would be less-than-significant.

Impact 4.7-10: Land Subsidence. Modeling conducted for the 2002 Zone 40 WSMP shows that groundwater elevations would be generally higher than the 2000 Baseline condition and, depending upon pumping distribution and localized groundwater conditions, higher or lower than spring 2000 levels. Lowering of groundwater levels is unlikely to result in substantial land subsidence. Historical data on subsidence in relation to past groundwater decline indicate that the area is not susceptible to substantial land subsidence with the anticipated future groundwater level decline. The range of land subsidence estimated to occur with the projected groundwater decline is 0.13 to 0.35 feet, and would occur over the course of several decades. Because no substantial land subsidence is expected to occur, this would be a less-than-significant impact.

The potential for land subsidence as a result of increase groundwater pumping is assessed in the Water Forum EIR at pages 4.2-19 through 4.2-20. Modeling data were used to estimate land subsidence with simulated groundwater level declines of 49 feet in Zone 40 (greater than currently projected). With calculated land subsidence to groundwater decline ratios of 0.007 feet per foot, a decline of 49 feet would result in additional land subsidence of up to 0.34 feet. This level of subsidence is unlikely to cause damage to infrastructure or to public or private property because it would occur gradually over a period of decades as groundwater levels decline. Historical evidence shows that land subsidence has been minor and regional with decline in groundwater levels, and this trend would be expected to continue. Land subsidence impacts would be less than significant.

Impact 4.7-11: Efficiency of Wells. Implementing the 2002 Zone 40 WSMP would result in groundwater elevations that are generally higher than the 2000 Baseline condition and, depending upon pumping distribution and localized groundwater conditions, higher or lower than spring 2000 levels. Lowering of groundwater may result in reduced efficiency of existing groundwater wells and the need to deepen existing wells and increase pumping at deepened wells. This reduced efficiency, however, would translate into an economic, rather than environmental impact, as the volume and quality of groundwater available are not expected to decline following well deepening or increased pumping. The economic effects would be the increased costs associated with the implementation of these actions. This is a less-than-significant impact.

The potential for reduced well efficiency as a result of increased groundwater pumping is assessed in the Water Forum EIR at pages 4.2-20 through 4.2-21. Modeling data were used to estimate the number of wells that would require deepening because of lower groundwater levels. The analysis estimated that the following number of wells in the Central Basin of south Sacramento could require deepening: 7 to 14 of 157 municipal wells; 0 to 19 of 385 agricultural wells; and 344 to 350 of 6,068 rural domestic wells. Because more recent modeling indicates that groundwater elevations would not decline to levels projected under the Water Forum, fewer wells may require deepening.

Concern was raised that implementation of the 2002 Zone 40 WSMP would result in greater seasonal variation of groundwater elevation (resulting in economic impacts related to well deepening), even if average groundwater elevation does not substantially change. Review of groundwater hydrographs at locations throughout the Central Area shows that seasonal variation in groundwater elevation is projected to be greatest at locations near municipal wells or wellfields (see Appendix F, Figures B6 through B16). As with the potential need for well deepening resulting from general lowering of groundwater, some wells near municipal pumping areas may require deepening because of greater seasonal variation. This reduced efficiency, however, would result in an economic rather than environmental impact because the volume and quality of groundwater available would not decline after well deepening. This would be a less-than-significant environmental impact.

4.7.3 ENVIRONMENTAL MITIGATION GUIDELINES

No mitigation is necessary for the following less-than-significant impacts:

4.7-1: Deliveries to SWP and CVP Customers

4.7-2: Operational Effects during Reverse Flow in the Sacramento River

4.7-3: Operational Water Quality Effects in the Sacramento River Downstream of Diversion

4.7-4: Operational Effects on Delta Water Quality

4.7-5: Potential Contaminant Discharge during Construction

4.7-6: Groundwater Elevation and Consistency with Water Forum Sustainable Yield

4.7-7: Hydrologic Impacts on the Cosumnes River

4.7-8: Groundwater Quality

4.7-9: Movement of Groundwater Contaminants

4.7-10: Land Subsidence

4.7-11: Efficiency of Wells

4.7.4 LEVEL OF SIGNIFICANCE AFTER MITIGATION

No significant water resources impacts were identified and no mitigation is required. All impacts remain less than significant.